DISCOVERY

A MONTHLY POPULAR JOURNAL OF KNOWLEDGE

EDITED BY A. S. RUSSELL, M.C., D.Sc.

No. 9. SEPTEMBER 1920 CONTENTS PRICE 6d. NET

PUBLISHED BY JOHN MURRAY, 50A ALBEMARLE STREET, LONDON, W.1.

DISCOVERY

A MONTHLY POPULAR JOURNAL OF KNOWLEDGE

No. 9. SEPTEMBER 1920. PRICE 6d. NET.

DISCOVERY. A Monthly Popular Journal of Knowledge.

Edited by A. S. Russell, M.C., D.Sc., 8 Severn Road, Sheffield, to whom all Editorial Communications should be addressed.

Published by John Murray, 50a Albemarle Street, London, W.1, to whom all Business Communications should be addressed.

Advertisement Office: 16 Regent Street, London, S.W.1.

Annual Subscription, post free: Inland 8*s.* 6*d.*; Abroad 7*s.* 6*d.* Single numbers 6*d.* net; postage, Inland 2½*d.*; Abroad 1½*d.*

Editorial Notes

A new journal, the *Psychic Research Quarterly*,[1] has appeared. Its aim is to give in a popular form a reasoned criticism and discussion of spiritualism, telepathy, and other problems of psychical research. It is neither definitely committed nor definitely hostile to spiritualism. Its aim is to get at the truth, or as near as possible to the truth, of these problems, whatever that may be, and to condemn nothing merely out of ignorance or prejudice. The editor himself declares he holds no brief for spiritualism. He thinks, on the contrary, a very strong case can be made out against it. At the same time he believes it is impossible reasonably to maintain that there is no plausible foundation for its doctrines. This is an excellent point of view. If the best obtainable contributions from all sides on the set of problems considered are published in this journal, the reader has every opportunity of forming his own opinion, and this is proposed to be done. Accounts of contemporary researches by reliable investigators and criticism thereon will be included in the journal, and also articles dealing with the relation of Theology, Philosophy, and Psychology to psychical research.

* * * * *

One of the most interesting articles in this excellent first number is that by Sir William Barrett, F.R.S., on the so-called divining- (or dowsing-) rod. How the dowsing-rod works has always been a puzzle to me. This article does not tell one how, for, it appears, no satisfactory cut-and-dried explanation of the phenomenon is yet forthcoming. But it clears up many doubtful points. It tells us what the water-diviners, or "dowsers," can do, and it suggests a cause of their power without attempting to elaborate details.

* * * * *

A dowser is a man with very special powers. He takes a forked hazel twig, and with the point of the twig upwards and a fork lightly held in each hand, he perambulates in a business-like manner over country in a search for underground water or ore. At certain places, sometimes, there is an unconscious and involuntary movement of the dowser's muscles which causes the twig to twist, and at these places is found the ore or the water which is sought. If any reader has not heard previously of water-divining, or dowsing, we may say that, if he asks us the question, "Do you mean to tell me that a man, by walking about with a piece of wood in his hands and waiting till it twists, can locate water?" our answer is "Yes." The fact seems well established, and examples of it will be quoted below. It is the explanation of the fact that is the difficulty, and which is rightly the concern of psychical research.

* * * * *

A case exemplifying the power of the dowser is given by Sir William Barrett in the following words: "I was anxious to put the dowser to a severe test by asking him to locate places where water would be found and where it would *not* be found. A site was selected in a field on the slope of Carrigoona Mountain [Ireland], where the most shrewd observer could not possibly predict beforehand the presence or absence of underground water at any particular spot. The rock is sandstone and quartzite, and water-springs only occur in a few places. I sent for a good English dowser, Mr. W. Stone, who came over specially from Lincolnshire, where he lived. The field was covered with grass, and the bed-rock was believed to be only

[1] No. 1, July 1920. (Kegan Paul, 3*s.* 6*d.* net.)

a few feet below the surface. The dowser marched to and fro, and fixed on two spots where he said plenty of water would be found within 20 feet from the surface, and another adjacent spot where he said no water would be found.

* * * * *

"Then I took him to another field on the other side of the mountain; here he declared no water would be found anywhere, the forked twig refusing to move in his hands. A second dowser, a successful amateur, was tried a few weeks later; he knew nothing of the previous dowser's visit. His indications exactly coincided with those of the first dowser. Boring apparatus was obtained and a set of boreholes were made, first in one field, then in the other. The bed-rock was deeper than we thought, and after boring through 16 feet of hard, dry boulder clay, at the spot where the dowser said water *would* be found, a splendid spring of water was encountered. At the spot, a few yards distant, where the dowser said there was no water, we bored down to the solid rock, and spent a week boring into the rock, but no water was found. At the third place, where he predicted water, we found, on boring, a splendid supply at 18 feet below the surface. In the other field on the opposite side of the mountain, where the dowser declared no water would be found, we bored in several places down to the solid rock, spending a whole month over it, but not a drop of water was to be found anywhere."

* * * * *

Several cases equally interesting are quoted. It appears that the dowser, the possessor of this curious faculty, is a rare bird, although pretenders are abundant. The late John Mullins, a Somersetshire dowser, was one of the most remarkable, and many of his successful locations in the eighties were striking. On several occasions, after large sums of money had been fruitlessly spent in boring for water, Mullins located water with his twig; one of the wells so found has produced no less than 3,000 gallons of water an hour for the last thirty years.

* * * * *

It seems quite certain that this power is genuine. For more than four hundred years stories describing it have been current. It is impossible to ascribe the successes to coincidence, or to explain the matter by saying that the failures are forgotten and the successes alone remembered. Also, we cannot reasonably declare that every man who tells these curious stories is a liar, drawing entirely on his imagination. On the other hand, it is difficult to see what connection there can be between a man with a piece of wood and an underground well. Why of all things should water be located?

Another thing seems fairly certain, and that is, there is no physical action between the water, or whatever it is that is being sought, and the twig. Murmurs in the literature about electrical, thermal, or radio-active forces show merely the ignorance of the writer in the elements of natural science. Something causes the dowser to twist the twig. This involuntary motion may be due to reflex actions, as in the beating of the heart; or may be the result of habit, as in walking; or the result of an emotional disturbance, as in pallor or blushing; or it may be due to some unconscious self-suggestion. The cause is psychical certainiy, and not physical, and a working hypothesis which is suggestive rather than explanatory is given as follows by Sir William Barrett:

* * * * *

"The explanation will, I believe, be found to be that the dowser possesses a ***supernormal perceptive faculty***, analogous, it may be, to the curious and inexplicable faculties (such as 'homing') which we find in many birds and animals, and our ignorance of which we cloak by calling them 'instinct.' This obscure perceptive power, or instinctive detection of the hidden object of his search, may not excite any consciousness of the fact on the part of the dowser, but it may be adequate to produce a nervous stimulus which will start the involuntary muscular action that twists the forked rod, held by the dowser in somewhat unstable equilibrium.

* * * * *

"As every student of physics knows, there are many physical phenomena which render such a hypothesis by no means improbable. A nugget of gold concealed in its rock matrix, a piece of metal enveloped within the trunk of a tree, a coin swallowed by a child, cannot be detected by any of our senses, but in each case the object is at once perceived if, instead of trusting to our visual perception of luminous rays, we trust to the impression made on a photographic plate or fluorescent screen by the shorter X-rays. Many objects quite opaque to our vision are quite transparent to ether waves, considerably longer or considerably shorter than the luminous waves. Hence, with a suitable detector of those longer or shorter waves, objects which may be completely hidden from our vision can be easily perceived if the object be more or less opaque to these waves. In the working hypothesis I have sketched, the dowser is the analogue of the detector of these longer or shorter ether waves, and the subconscious nervous and muscular disturbance produced on the dowser by the hidden object of his search is the analogue of the molecular disturbance produced in the electric coherer or fluorescent screen or photographic plate."

It is a very remarkable subject, and the results of further research in it will be awaited with interest.

* * * * *

Dr. Dawson Turner, of Edinburgh, has written Lieut.-Col. Crawley, one of our contributors, regarding a point in the early history of wireless telegraphy. On p. 207 of DISCOVERY, Col. Crawley had written: "This coherer action was enunciated by Professor Branly in France in 1890, and a coherer itself was first used for laboratory experiments by Sir Oliver Lodge in this country in 1894." The experiments of Sir Oliver Lodge are usually mentioned as being the first practical work carried out with coherers in this country. As a matter of fact, in 1892 Dr. Dawson Turner showed Branly's coherer experiments in an improved form to Section A of the British Association, and at this and other meetings a little later, made use of the coherer to ring an electric bell and so act as a burglar alarm. Sir Oliver Lodge saw Dr. Turner's experiments at this time, and borrowed some of the powders he was using.

The Housing Problem

By W. S. Purchon, M.A., A.R.I.B.A.

Head of the Department of Architecture and Civic Design in the Technical College, Cardiff

IT is perhaps not unfitting that an article on Housing should appear in DISCOVERY, for while housing troubles have been with us a long time, the problem is one of the most serious of those now confronting us, and novel methods are being adopted in tackling it.

For years before the war serious investigators had drawn attention to the facts that large numbers of the houses built in our towns in the first half of the last century, when workers were crowding to the new works and factories, were of such a type and packed so closely together as to be a menace to the welfare of the community, and that most of the dwellings erected in the second half of that century and in the earlier part of the present one, notwithstanding, and in some cases actually because of, increasing stringency of by-laws, were arranged without inspiration and with little or no consideration of the amenities of life.

It is often urged that the people make the slums, but experience of back-to-back houses leads one to marvel at the struggle which many of the tenants are making, against heavy odds, to keep their little homes as clean and pleasant as possible.

The problem was a big one before the war, and unfortunately it was not tackled in a big way. In fact the grave shortage of houses is not only due to the stoppage of building during the war, but also to the rapid decline in house construction which developed in the preceding years.

It is less difficult to grasp the facts if one town is taken as an example, as the figures for the whole country are somewhat bewildering. This town—which need not be named—is more or less typical of many of the manufacturing centres; in some the problem is more serious, in others less. It has a population of about half a million, and contains approximately 100,000 houses. Of these some 16,000 are of the well-known "back-to-back" type, and a further 8,000 are considered by those well qualified to judge to be more or less insanitary, making 24,000 houses which ought to be replaced as soon as circumstances permit. Owing to the two causes previously mentioned, there is an estimated shortage of 6,000 dwellings, and to make provision for the normal growth of population 1,000 new houses are required each year.

In tackling a problem of this kind the wise course is to look ahead, and taking the above figures as a basis, a little simple arithmetic shows that during the next twenty years some 50,000 houses ought to be built in or near that town, while 24,000 of its existing dwellings should disappear in the course of that period. Changes may, of course, take place in the rate of development of any town, and the numbers given may be found to apply to eighteen or twenty-five, instead of to twenty years. Such figures, however, make it clear that our schemes should be on generous lines, that the individual houses should be designed with care and skill, and that considerable forethought should be exercised in deciding the general outlines of town development.

An examination of most of our cities shows that the great growths which took place in the half-century preceding the war were carried out in the main without any comprehensive scheme, have a general effect which is usually most depressing, and consist of houses which are normally more or less inefficient. One remarkable fact is that while English architects are world-famous as house designers, an amazingly small proportion of English houses was designed by them. The folly of this has fortunately been realised at last, and most of the houses which are to be built in the coming period will be the work of skilled designers. In this work there are two main parts—the individual building, and the general scheme of development.

In designing the new houses the first point to be settled is the accommodation which ought to be provided. It is sometimes stated that there is no need to build more of the smallest class of house, as there are plenty of them in existence. It may well be urged, however, that many newly-married couples would prefer to start in a small way, provided they could obtain

well-arranged accommodation in reasonable surroundings, and a further consideration is that it is not desirable to condemn the old people, whose children have grown up and married, to the old conditions.

On the other hand, a fair proportion of the largest class of dwelling usually built in housing schemes is required for the larger families. The large living-room was a useful innovation of pre-war days. The family usually spends most of its time—when indoors and not in bed—in the room which has a fire, and it is better that this should be a comparatively large and airy room rather than a cramped and stuffy kitchen. In the case of the larger families a very good case can, however, be made for a parlour in addition to a living-room. To give one reason only, without this room in which the children can do their homework and in which the father can read and prepare his essays, the "open door" to higher education is almost closed, and the Workers' Educational Association is sadly handicapped.

While talking about "open doors" it should be mentioned that if there are two doors in the living-room, they should be so placed that only a small part of the room is crossed in passing from door to door.

For many years the provision of a bath was a vexed question. It is now generally agreed that it is a necessity, and that it is best arranged in a separate apartment. Some argue that it should be on the ground floor, because many workers come home dirty and ought not to go upstairs in that condition. The right line of development appears to be that of providing proper cleansing facilities at the works, and putting the bath on the upper floor of the house, a position which most readers of DISCOVERY have in all probability found very convenient.

The average pre-war small house was narrow-fronted and had a series of back projections which kept light and air from the back room; the newer type of house has a wider frontage, and projections are either entirely omitted or reduced to a minimum. This method of planning gives a maximum of light and air to each room.

In view of the cost of upkeep, the construction should be as sound and as simple as possible. Our faith should not be pinned to any one material, whether it is one which has received the sanction of tradition or one boomed as an innovation by one or other of the daily papers; but we should experiment fully with every available material and any method of construction which seems at all likely to be satisfactory, while old methods should not be "scrapped" merely because they are old.

Everything possible should be done to reduce the labour involved in running a house. While it is wise to provide a picture-rail in the principal rooms, mouldings which collect dust should be eliminated as far as possible, while metal work which requires polishing should be reduced to a minimum. Much can be done by careful planning of the house, and by the provision of skilfully devised fittings and an efficient hot-water supply to the scullery-sink and bath. It is amazing that such a large proportion of our pre-war small houses had no hot-water apparatus.

Electricity will probably be used for lighting in most of the schemes. For cooking, a coal-range in the living-room and a small gas-cooker in the scullery will probably be, on the whole, the best arrangement available for some years. A coal fire will also in most cases be provided in the parlour and in two of the bedrooms. Coal fires have great advantages, but must ultimately be superseded by methods of heating and cooking which do not pollute the air with smoke. One important point is that the ranges and grates should be really efficient. It is not sound economy to save, say, twenty shillings on these fittings if that saving involves the tenant in additional expenditure on an extra ton of coal each year. This comment applies to many other items in house construction. It is obvious that we must keep down first cost as much as possible, but it must be done with an eye on future expenditure. To use a cheap lock, for instance, which ceases to function after a year or so, is extravagance, not economy.

Attention to the above points will lead to the provision of houses which are far more healthy and useful than the average pre-war house, and the employment of skilled architects will also result in houses which are far more pleasing in appearance with little or no additional cost.

While the individual house will thus approximate more nearly in its efficiency to the bicycle, motor-car, and aeroplane, the question of the disposition of the houses on the site must also receive careful attention. The great majority of pre-war houses were all built more or less to the same plan regardless of aspect, with the result that in a large proportion of houses the sun either entered none of the rooms or the wrong ones. This seems a simple, obvious matter, but it is true to say that for the first time large numbers of small houses are being built specially designed so that the sun shall lighten the living-room and be kept out of the larder.

Again, instead of the dreary, monotonous rows of houses which complied rigidly with pre-war by-laws, the new houses are being arranged in short blocks, each usually consisting of four houses, a method which gives a more pleasant and a healthier result.

Owing largely to lack of forethought in the days before the war, unimportant roads and footpaths were often made unnecessarily wide and expensive. Now that schemes dealing with considerable areas are being worked out carefully, much money can be saved and

far more pleasing results obtained by making unimportant roads and paths narrow and light in construction. This does not mean that the houses facing each other will be closer together, but that additional space will be available for front gardens and grass margins.

In working out these schemes, shops can be built *as* shops, not as houses which are afterwards converted more or less inefficiently. A shopping centre can in fact be arranged for, and suitable sites can also be reserved for allotments, playing-fields, schools, libraries, churches, etc.

When the house shortage has been adequately dealt with, the existing bad houses can be replaced by proper homes, in some cases on the same sites, but generally in more pleasant surroundings. The sites thus cleared may be used as open spaces, or as sites for works extensions and business premises, and in making these alterations great street improvements may be effected.

In order that these changes may be the most beneficial, the whole problem of the present town or district must be considered carefully, and an outline scheme for its future development worked out.

It has been suggested that some towns are already sufficiently large, and that their future development should be in the form of separate villages organically connected with the towns but separated from them by belts of open country. Whether this suggestion is adopted or not, a carefully-worked-out scheme will give far better results than the haphazard methods of the past.

BOOKS RECOMMENDED

New Townsmen, *New Towns after the War* (J. M. Dent & Sons, Ltd., 1*s*.).

J. S. Nettlefold, *Practical Housing* (Garden City Press, 1*s*.).

Richard Reiss, *The Home I Want* (Hodder & Stoughton, 2*s*. 6*d*.).

Martin, *The Small House* (Alston Rivers, 2*s*.).

Allen, *The Cheap Cottage and Small House* (Batsford, 8*s*. 6*d*.).

Gotch, *The Growth of the English House* (Batsford, 10*s*.).

Unwin, *Town Planning in Practice* (Fisher Unwin, 42*s*.).

A Unique Transmission System

By W. Harold Johnson, M.A.

THE transmission of power has always been one of the most acute of engineering problems. It is not that the transmission in itself offers any insuperable difficulties, but that as soon as one has to turn corners, as one nearly always has sooner or later in any transmission system, there is a considerable loss in efficiency. The steam engine that is generally coupled direct to the useful implement that it operates, whether it be the propeller of a ship, the wheels of a railway engine, or the spindle of an electric dynamo, is much more easily handled than is the comparatively new prime mover that bids fair to oust the steam engine from all the spheres that the older unit has previously occupied unassailed. And the internal combustion engine is above all things primarily suited for use in mechanically propelled vehicles, in which, with the solitary exception of the aeroplane, the turning of corners in the transmission system is a difficulty that has to be encountered and overcome.

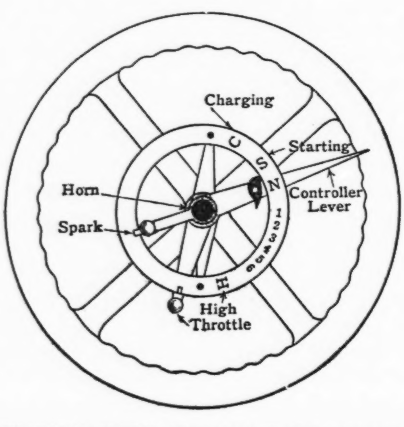
The internal combustion engine relies for its power output primarily on its speed, and consequently there is incorporated in every motor-car mechanism known as the change-speed gear, or simply the gear box, which has the effect of making possible a change in ratio between the engine and road wheels, but at the same time necessitates the turning of corners by the power in its path from engine to back axle. On a normal car the engine makes four revolutions for every single revolution of the back wheel when the car is travelling on what is known as top gear. On bottom gear this number of revolutions is increased up to as many as 16 to 1, and the intermediate gears, that may be one or two in number, generally offer ratios of something like 6·5 and 10 to 1, or if there is only one intermediate ratio this generally is in the neighbourhood of 7·5. The gear box, while quite reliable and satisfactory enough in the hands of a careful and experienced driver, is one of the most delicate components of the car, and is liable to considerable damage as the result of careless handling. Various means have been suggested to enable its entire abolition from the car chassis together with that of the clutch, which is an essential component for the operation of the gear box, although it is constructed as an entirely separate unit from it. Hydraulic transmission systems have been suggested and tried with varying success, the extent of which may be judged from the fact that not a single hydraulic system has ever "caught on" in technical circles.

The idea of using electricity for the transmission has been employed satisfactorily on the Tilling-Stevens heavy chassis for many years, the essentials of this system consisting of an electric dynamo operated by the engine and generating current for a motor which drives the back axle in the ordinary way. But an electric transmission system that is entirely new to this country has recently made its appearance under the name of the Entz, fitted to an American car known in America as the Owen Magnetic, but to be called over here the Crown Magnetic, and in due course, it is hoped, to be manufactured in this country. The transmission itself cannot be described as absolutely new, for the Owen

Magnetic car has been on the American market for some time, and the Entz transmission system has been employed with success on some American battleships. Nevertheless, its commercial application to the propulsion of road vehicles is a new thing over here, and it is from this point of view that I am undertaking this description for readers of DISCOVERY.

To give a full and detailed description of every component of the system in its practically applied form would mean writing a small volume, and consequently this account of the Crown Magnetic car must be regarded as a compromise between a technical description of the leading chassis features and a full exposition of the working of the transmission system. I want to make it clear to the best of my ability just how this transmission system operates, and merely to avoid a charge of obvious incompleteness I intend to refer first—though more or less casually—to such features of the car as would interest the motorist as such.

Enclosed under the bonnet and behind the radiator of conventional design is an ordinary, although large, petrol engine, this having six cylinders with a bore and stroke of 102 × 140 mm., giving a nominal horse-power output of 38, although, of course, the actual output is much in excess of this, for the engine is constructed on the most up-to-date lines and has the overhead



THE CROWN MAGNETIC STEERING WHEEL, SHOWING THE VARIOUS POSITIONS FOR THE CONTROLLING SWITCH.

valves which have become so popular on car engines as the result of aero experience during the war. The springing of the car is conventional, being by semi-elliptic springs all round; and combined with the comparatively high weight of the vehicle, some 2½ tons, ensures perfect comfort for the occupants over all types of roads. Detachable wheels and electric lighting and starting complete the equipment. And now to deal with its transmission system.

Firstly, let us be quite clear that we understand the working of the electric dynamo and motor. An ordinary dynamo used for the generation of current consists of a set of electric magnets between the pole pieces of which revolves an armature, i.e. a soft iron core wound with insulated wire. This armature is by some mechanical means revolved on its longitudinal axis between the pole pieces of the magnets, and this revolution and the consequent cutting of the lines of magnetic force from the magnets by the windings of the armature are the immediate cause of the generation of current. Other things take place, of course. There is, for instance, the building up of the current, as it is known, for as soon as the armature begins to revolve, the magnetism of the magnet is increased and armature and magnets work together to give the desired result of a high-current output. These further details, however, are beside our present purpose. What I want to be perfectly clear is that the generation of current depends on the revolution of the armature inside the magnets, in other words, on the *difference* in speed between the two components. From the purely electrical point of view it would not matter whether the armature were revolved mechanically inside the magnets or the magnets were revolved mechanically outside the armature. The same difference in speed would be present, and we should have the same result of the generation of electric current.

To go a step further, suppose we had the two necessary components of a dynamo mounted in correct relation to each other and together mounted as a single unit on a pedestal in such a manner that *both* components were free to revolve. If we now turn either the armature or the magnetos by mechanical means the second component will follow the one that is revolved, through the action of what is known as magnetic drag. In other words, there will be no difference in speed and there will be no generation of current.

So far, so good, and now for the motor. In essentials of construction the electric motor is the same as a dynamo, but instead of one component being operated by mechanical means, current is fed, usually to the magnets, and the armature is thus given a rotary motion by magnetic attraction. In the dynamo, then, we apply mechanical energy and take out electrical, in the motor we apply electrical energy and take out mechanical. With this great difference the two units are the same, and the remarks above as to the relativity between the actions of armature and magnet apply to the motor just as they do to the dynamo. Here we have, then, the principles of the Entz transmission in a nutshell, and we can now proceed to a description of its practical application on the Crown Magnetic car.

Extending forwards from the back axle, which is of normal construction, is a propeller shaft as in any car

of standard design. But the forward extremity of the propeller shaft, instead of terminating in the gear box and being continued through it to the clutch, ends in a bearing in line with the engine crankshaft. Just aft of this bearing is an electric armature, and about a foot rearwards of it, also on the propeller shaft, is a second. Positioned round the first armature is a set of electro-magnets bolted to an extension of the engine fly-wheel. Positioned round the second armature is a second set of field magnets attached rigidly to a casing mounted on the main chassis frame. It will be seen that whenever the car moves along the road, whether it be pushed by hand or moves under its own power, the two armatures revolve, as they form an integral part of the propeller shaft. It is also obvious that the first set of field magnets also revolve when the engine is running and under no other conditions, and that the second set of field magnets do not revolve at all.

Assume the car to be standing still with its engine running. The first set of field magnets, known as the rotating field, i.e. those bolted to the engine fly-wheel, are spinning round their armature, which is stationary. There is, therefore, being generated in this unit electric current, for armature and magnets together form a dynamo pure and simple. When the controlling switch on the steering wheel, about which I shall have a word to say a little later on, is in the neutral position, this current is as it were wasted—it is not turned to any practical account; but as soon as the switch is put into the No. 1 position, which is that for moving the car forward, the current generated in the dynamo is passed to the secondary motor, which is thus energised. We have now, therefore, two forces at work, both tending to drive the car forward. The first is the magnetic drag between the rotating field and its armature, the second is the ordinary electric motor action in the secondary motor through the fact that current is being supplied to it from the first unit.

The practical result is that the car begins to move forward, and this *beginning* to move forward is one of the most striking features of the behaviour of this wonderful car on the road. I would defy the most sensitive of individuals to tell from a purely physical sensation with his eyes shut when the car began to move. The beginning is practically imperceptible, and provided the engine be not accelerated, the rate of movement is incredibly slow. As the engine is accelerated, the magnetic drag and the slip between the two units of the first electrical component are increased. Thus the amount of current supplied to the secondary motor is also increased, and the torque or turning moment conveyed to the back wheels is proportionately enhanced.

After the car has gathered speed, the controlling switch is put into the No. 2 position, which is equivalent to a changing up in gear ratio on an ordinary car. Now the magnetic drag between the rotating field and its armature is increased, the slip is decreased, and so is the amount of current supplied to the secondary motor; and so one goes on through the third, fourth, and fifth positions, until when the controlling switch is put in the last or high position the rotating field and its armature are mechanically locked together. There is no slip, and thus no current is supplied to the secondary motor, the drive from engine to back wheel being entirely through the primary unit. But as the armature of the secondary motor is revolving and its magnets are stationary and no current is being supplied to its magnets, this motor automatically becomes a dynamo, and thus generates current which is passed back to the primary motor and serves to ensure the magnetic lock.

It will be seen that at no time is there any positive connection between engine and back axle. There is, of course, an air space between the armatures and their magnets, and the torque of the engine is conveyed to the propeller shaft by magnetic means across this air space. Thus the transmission has what may, for purposes of illustration, be termed an infinite flexibility, and it is impossible to get on the Crown Magnetic car that feeling of jerkiness or unevenness of running that is common on an ordinary car, especially at low speeds and with an inferior clutch or an inexpert driver. Some people who have ridden in the Crown Magnetic car tell me that they seem to experience a sensation of slip all the time, but I have been in the car several times and I can emphatically state that this was not my experience at all. I imagine that in the instances referred to it was a case of auto-suggestion. The critics expected to feel a sensation of slip, they made themselves feel it, and that is all.

To deal with the control of the car from the driver's point of view, this has already been covered in passing in the foregoing description, but may perhaps be advantageously treated explicitly. In the centre of the steering wheel there is a complete circular ring, on the left-hand half of which are mounted the throttle and ignition levers that are found on any ordinary car. It is on the right-hand side that all the Crown Magnetic characteristics are to be found. Here we have a lever rather larger than the ordinary throttle lever, which replaces both clutch and gear lever. The quadrant round which this lever works is marked C, S, N, 1, 2, 3, 4, 5, H. To start the engine, the lever is put in the S position, when the current is taken from the 24-volt batteries that form an integral, although not an essential, component of the system to the primary motor, the armature of which they energise through brushes of the ordinary type, and which then turns the rotating field magnets and so the engine, which is thus started in

the ordinary way. The C position is for giving an extra charge to the batteries should this at any time be necessary, although this is seldom likely, as they are continually being recharged when the car is being driven along the road, as is the case on an ordinary lighting and starting set. The N position is the neutral; the other figures on the quadrant have already been dealt with.

There is no clutch pedal, but there are three pedals to be operated by the driver, the left being the brake, the next to it being the accelerator or throttle pedal, and the next the magnetic brake, which, as a matter of fact, may for all intents and purposes be ignored, for it can never bring the car to a standstill and so very few drivers will trouble to employ it. At the side of the driver there are two levers as in an ordinary car, one for operating the hand brake (both hand and foot brakes operate direct on the rear wheels); the other is a gear lever which at first sight seems something of a paradox. Actually, however, it is simply there for engaging a pair of spur pinions to give a reverse gear. When it is required to drive the car backwards, the controlling switch is put in the N position, this gear lever is put into the reverse position, and then the control switch handle is operated just as when it is required to drive the car forwards. Obviously there are as many reverse ratios as there are forward. The whole of the control from the switch on the steering wheel is conducted through a control box constructed on similar lines to that of the ordinary tramcar, this box being mounted immediately above and parallel to that portion of the steering column that goes under the bonnet.

As regards the characteristics of the behaviour of this car on the road, I have already spoken of the most striking, namely, the remarkable smoothness and slowness with which it may be moved from rest. On a test performance the car took no less than thirty-seven seconds to travel its own length. It may be that some readers will think that this performance could be equalled on an ordinary car without, of course, any stops between the time of the first movement of the wheel and the end of the journey, but could it be done on an ordinary car *without a driver*? for that is what can be done on the Crown Magnetic. One may stand at the side of the car, put the control switch in the starting position and then into the No. 1 position, and then one may stand aside from the car and watch it uncannily begin to move forward entirely under its own power and with no one in it! One rather spectacular possibility with the Crown is to start it in this manner, then walk to the front of the radiator, place one's hand and weight on this component and so stop the car. On removing the pressure the car will slowly move forward once again. Another rather striking illustration of the characteristics of this car came to my notice more or less by accident. The magneto switch was out of action and the driver had to stop the engine. He adopted the equivalent procedure of putting on the brakes and letting in the clutch with the engine running slowly, which, of course, is a common method of stopping the ordinary car engine; but whereas with an ordinary car as soon as the clutch is let in the engine stops, with the Crown Magnetic it took something like ten seconds after the controlling switch had been put through the No. 1 as far as to the No. 3 position before the engine stopped.

As to whether Entz transmission will ever become common on cars I hesitate to express an opinion. It certainly has wonderful possibilities, but I rather doubt if its efficiency on top gear is as high as that of the ordinary transmission. Moreover, although experience does not suggest that it will give much trouble or demand more maintenance attention than is the case with a conventional car, it is a fact that should anything go wrong on either of the two motors it is likely to be of such a drastic character that it will be a job for the makers alone to put right. But only experience can tell how the car will turn out after extended use. It has been used on American models for some few years, and no special difficulties have been encountered; and I see no reason why the conservative prejudices of the British public should not be overcome by this wonderfully attractive car, as it has been overcome by other things equally revolutionary in the past. At present the car is made only in the one model, which is not only large but correspondingly high-priced. If, as is to be hoped, it is ever introduced in a medium-priced or light-car form, then there may be a very different story to tell as to the course of its attack on the British market.

How the Turks came into Europe

By F. F. Urquhart

Fellow and Tutor of Balliol College, Oxford

DISCOVERY is a rare adventure in historical studies. When there is a change in the accepted judgment on past events or characters, it is usually the result of a slow process, a work rather of progressive occupation than a raid. Walter Scott and Maitland both belong to the army which has slowly reconquered the Middle Ages, and Cromwell's real character was not established in a day. Occasionally, however, it has been the

good fortune of a single man, or even of a single book, to throw such new light on a great event that it is really a discovery. Such a book is Dr. Gibbons of Princeton's *Foundations of the Ottoman Empire.* It was published in 1916, but its lessons have yet to be learnt by those who discuss the Eastern question in the Press. They have no immediate relation to the problems of to-day, but they affect very materially the historical background.

According to the traditional view, the origin of the Ottoman Empire was an invasion of Turks coming originally from Central Asia. In the eleventh century the Seljuks had settled in Asia Minor and parts of Syria. The Crusaders drove them back from the coasts, but they remained in the interior, and were reinforced by fresh immigrants from Turkestan. One of these migrant tribes established themselves east of Brusa in the thirteenth century. With all the vigour of a young people, they gradually took the place of the Seljuks. In the words of Von Hammer, the father of modern Turkish History, "the Empire of the Seljuks broke up, and on its ruins rose that of Osman." At the head of the Turks of Asia Minor the Osmanli pushed across the Hellespont, and, taking advantage of the mutual antagonism of Greek, Bulgar, and Serb, conquered the Balkan Peninsula and then pushed on towards Central Europe. It was the invasion of Europe by a non-European people, by a collection of nomad tribes effectively organised for war breaking in among settled peoples, and setting over them the rule of an alien religion and an alien race.

For this, the traditional story, Dr. Gibbons would substitute something very different. According to him, the small Turkish tribe over which Osman began to rule in 1288 consisted of no more than 400 families. They had occupied for some fifty years a small district east of the Asiatic Olympus, living in friendly relations with their neighbours. Under Osman the tribe became converted from paganism to Islam, and the conversion was followed by a gradual extension westwards. Before Osman's death his people had risen to 4,000 families, but this tenfold increase was almost entirely in districts which had hitherto been part of the Byzantine Empire. The new Osmanli were in great majority "Greeks" who had become Moslems. They preserved many Byzantine customs and used Byzantine law, though the Turkish language prevailed. At first the country districts and then the historic cities of Brusa, Nicæa, and Nicomedia surrendered to the new power. Though Constantinople was so close it gave no help. Distracted by unceasing personal and family feuds, the Palæologi, "the most iniquitous family that ever disgraced the kingly office," made no serious attempt to save the province or the cities. The military defence of the Empire was left to ill-paid and quite untrustworthy mercenaries, often Turks themselves, or to the fitful help received from Genoa or Venice. The Greek Church had hardly more life than the Empire. Its missionary effort had long been exhausted, and its chief interest, and that was passionate enough, lay in the controversy with the Latins. The choice made by the pagan Osman showed which of the rival religions seemed to have more vitality. The new converts to Islam spared the Greeks even the saving grace of persecution. A number of Osman's chief followers became Moslems, but only after they had for years served him faithfully as Christians. The tradition of toleration survived; even as late as 1384 a body of French pilgrims who had returned from the East praised Murad I for his humanity and for allowing the Christians to live under their own laws.

Under Osman's successor, Orchan, the new State began to establish itself permanently in Europe, but only after the Osmanli troops had been for years employed by the Emperor in his civil wars or against the Serbs. Once definitely across the Hellespont, its power advanced with astonishing rapidity. Thirty-five years after the capture of Gallipoli, Serbian independence was destroyed at Kossova. The history of this advance is well known, but Dr. Gibbons emphasises the great part played in it by the Christian Allies and the very numerous converts of Islam. The Sultans never seem to have fought a battle without Christian troops, and they showed a power of turning enemies into allies parallelled perhaps only by the British in India. Just as the Sikhs took our side in the Mutiny within eight years of their annexation, so the Serbians fought for the Turks against the Western Crusaders at Nicopolis, within seven years of Kossova. The friendliness of the Balkan Christians stood the test even of misfortune. In 1402 the great host of Sultan Bayezid, with its Christian contingents, was routed and scattered by Timour at Angora, and the Sultan himself taken prisoner. The relics of the Osmanli army straggled back to the coast. Greeks, Genoese, and Venetian colonists vied with one another in helping them over to Europe, and no attempt was made by the Balkan peoples to combine against the defeated and disorganised Osmanli.

The conclusion seems to be that the so-called "Turkish" invasion was the invasion of a creed and a spirit rather than that of a race, a victory of a young and vigorous faith over one which had unhappily become degenerate. It was only when the Osmanli power had reached the Danube that its armies, which must have largely consisted of Europeans, turned eastward, and reduced the Seljuks of Asia Minor. It was not till the days of Selim, in the early sixteenth century, that Syria and Egypt were overrun and the conquest of Arabia begun. This Eastern expansion and contact with the

more fanatical Arabs destroyed in time the tolerant character of the early Osmanli government, but Dr. Gibbons' book is a curious commentary on a manifesto issued some months ago by a number of his most distinguished compatriots in America, in which it was said that "five hundred years ago the Turk entered Europe with a sword, with massacre, with outrage, with pitiless persecution." Our policy towards the Turks should be based on principle and not upon history, but if historical arguments are introduced, they should be real history.

Modern Methods of Weather Forecasting

By Donald W. Horner, F.R.A.S., F.R.Met.Soc.

The empirical methods that were good enough for our forefathers have, during the past half-century, given place to a scientific system of weather forecasting, based upon synoptic weather charts constructed from information received by telegraph from various stations situated throughout Western Europe, and also from wireless messages from ships in the Atlantic Ocean.

It must be admitted that, notwithstanding all this mass of information and every precaution that may be taken to ensure the correctness of forecasts, there are times when the forecast fails altogether, or arrives too late (in the case of storm warnings) to be of use. Cases of this sort, however, become more rare year by year, *ninety-five per cent.* of the forecasts now made by the British Meteorological Office being correct in most details, the remaining five per cent. only being complete failures. This work, undertaken on a sea-girt island like ours, with only wireless information from moving ships upon which to depend towards the westward, the direction from which most storm-bearing depressions come, compares very favourably with that of the United States Weather Bureau, whose percentage of successful forecasts, with a vast continent covered by a network of local forecast officials, amounts to ninety.

That these few failures may in due time be eliminated is shown by the continuous advances made in recent years.

The Forecast Division of the British Meteorological Office now has its headquarters quite separately at Kingsway, London, W.C.2, the original buildings at South Kensington being used only for climatological purposes. A third branch of the Meteorological Office is the recently-taken-over offices of the British Rainfall Organisation at 62 Camden Square, London, N.W.1, under the able superintendentship of Mr. Carle Salter, F.R.Met.Soc.[1] This is what may be termed a branch of the Climatological Section, as the observations of rainfall, gathered together annually by over 5,000 voluntary observers, are very valuable, and are published annually in volume form in *British Rainfall.*

But in following climatology, we have left our original subject of forecasting.

The name *forecast* was invented by Admiral Fitzroy more than sixty years ago, and it is to the original idea propounded by him at that time that we owe the elaborate system of forecasting by means of synoptic weather charts practised in the present day.

The first forecasts were issued in 1861, and at an even earlier date storm warnings to sailors and fishermen were exhibited on our coasts.

At first these took the form of drums, but these have been superseded by *cones*: the *south* cone, having its point *downwards*, being hoisted on the harbour flagstaff when gales are expected from the south-east, south, south-west, or west, veering north-west; and the *north* cone when the storm is anticipated from the north, north-east, east, or north-west, veering to the northward, but not when backing westward.

The weather maps published daily in certain newspapers are thus prepared:

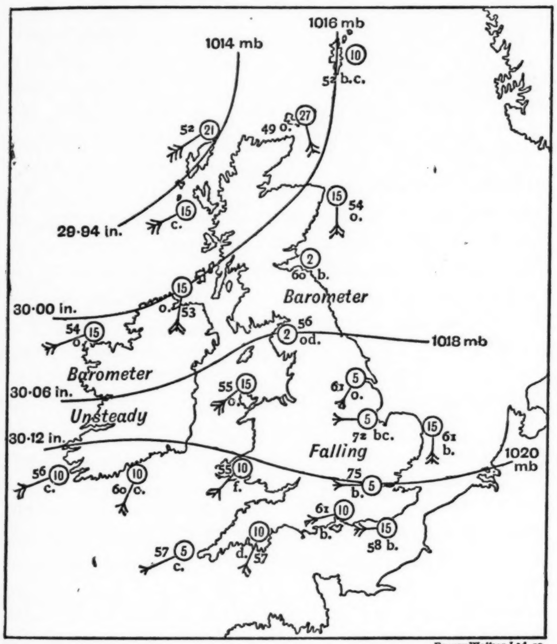
The state of the weather, sky, and direction of the wind are taken at a large number of stations in the British Isles, the continent of Western Europe, and at the Azores, at 7 a.m. G.M.T. These observations, together with readings of the mercurial barometer in *millibars* and of the thermometer in degrees *absolute*, on being received at the Central Office of the Forecast Division, are plotted by skilled cartographers on charts, forming what is known as a synoptic chart, a term which will be explained later.

These charts are lithographed for the Daily Weather Report, which is sent out to subscribers by post, and at 6 p.m. electros of similar charts are supplied to newspapers willing to give sufficient space to the subject. The papers at present reproducing them are *The Times*, *Daily Telegraph*, and *Morning Post.*

These maps consist of the contour lines of North-western Europe, having the lines of equal barometric pressure (*isobars*) drawn thereon. These isobaric lines are drawn through all places having an equal pressure at the same instant of time; e.g. on June 17, 1919, the evening weather map showed that the barometric reading of 1020 mb. (30.12 in.) started from the coast of France, passed over the Essex side of the Thames estuary, and across London to the Irish Channel, and over to the West of Ireland. The next isobar (1018 mb.) ran across the centre of England and

[1] Voluntary observers are always welcomed for this section, and a post-card to the Superintendent will bring a reply as to where fresh rainfall records are most required.—D. W. H.

north of Ireland. In this particular case the isobars were fairly wide apart, and light or moderate winds prevailed; except where, off the north-west of Ireland, the 1018 mb. isobar just mentioned closed into a 1016 mb. isobar, which came down from the north to meet it. Here the wind is seen to be blowing in freshly from the westward, illustrating one of the points of the utility of the weather map.[1] Barometrical gradients are measured in hundredths of an inch (or about $\frac{1}{3}$ of



Emery Walker Ltd. sc.

a millibar) to fifteen nautical miles. According to the "steepness" of the gradient, so will proportionately be the strength of the wind. If the difference between the readings of two barometers (and therefore the denomination of the two resulting isobars) amounts to ·07, the wind will be less strong than on a day when they differ by ·14, and so on in proportion.

The following table of gradients is useful:

Gradient .	0·5	3	7	15
Velocity of wind in miles per hour .	7	25	50	80
Wind . .	Light breeze	Fresh breeze	Gale	Hurricane

Gradients are calculated in the following manner: If a barometer at one station, which we will call (*a*), reads 29·14 in., and at another station, called (*b*), 29·28 in., station (*b*) being thirty nautical miles distant from (*a*), then the difference in barometer readings is fourteen hundredths (·14) of an inch in thirty nautical miles, or seven hundredths (·07) in fifteen n.m.; hence the gradient is said to be seven.[2]

This system of gradients, in conjunction with Buys Ballot's Law, may be said to be the "backbone" of the synoptic weather chart. This law, which may be called the "Law of Storms," tells us that if we stand with our backs to the wind, low barometric pressure will be to your left hand and high on your right. This is only the case, however, in the northern hemisphere; south of the equator the opposite is true, and when we have our backs to the wind, the low pressure would be on our right hands and high on our left.

For the rest, these weather maps show us direction and force of wind by means of arrows flying *with the wind*, the force being shown by the number of barbs. A calm is indicated thus: ⊙. The figures in the circles at the end of the arrows, i.e. where the point should be, show the velocity of the wind in miles per hour.

The figures just beside the arrows show the temperature at the time of observation. The small letters show the state of the weather in the Beaufort Notation, thus:—

b = blue sky; fine weather.	*p* = passing showers.
bc = detached clouds.	*q* = squally.
c = cloudy generally.	*r* = rain.
d = drizzling rain.	*rs* = sleet (rain and snow).
e = damp; wet air.	*s* = snow.
f = fog.	*t* = thunder.
g = gloom.	*u* = ugly, threatening.
h = hail.	*v*[3] = visibility; clear horizon.
l = lightning.	*w* = dew.
m = mist.	*x* = hoar frost.
o = overcast.	*y* = dry air.[4]

z = dust haze; the turbid atmosphere of dry weather, generally associated with E. or N.E. winds.

Since the conclusion of the war the Meteorological Office has come under, and we might say become part of, the Air Ministry, with Sir Napier Shaw, F.R.S., as Director, and Lieut.-Colonel Gold as Superintendent of the Forecast Division. It is quite in accordance with the fitness of things that the Air Ministry and the Meteorological Office should "join hands," so to speak, as in peace, even more than in war, meteorology and aviation must necessarily be of mutual benefit the one

[1] Although the wind was generally light inland, on the coasts there were fresh local sea breezes, especially in the north of Scotland.

[2] Inches of mercury can be converted into millibars if we take ·03 in. as equal to one millibar.—D. W. H.

[3] The Beaufort Notation must not be confused with the International Weather Symbols, in which V = rime frost, and the letter *v*, which used to stand for exceptional visibility, was abolished at the International Meteorological Conference in October last, the sign O being substituted for it.

[4] Humidity less than 60%.

to the other; the former showing by means already acquired how the latter may avoid disaster by pointing out unsuitable periods for starting on aerial voyages; whilst the latter, by facilitating the means for the investigation of the upper regions of the atmosphere, will enable the meteorologist to make new discoveries in realms undreamt-of hitherto. So in this way it may be shown that neither science is subservient to the other, but that meteorology and aviation can ever work side by side to the mutual benefit of both.

The Russians and Their Proverbs

By Louis Segal, M.A., Ph.D.

Head of the Russian Department in the University of Birmingham

THE proverbs of a people reflect, to a great extent, their conceptions and sentiments, and allow often a keen insight into national characteristics and mentality. There are, therefore, certain advantages in studying the psychology of a nation from its maxims. The proverbs represent the practical philosophy of the populace, based on the experience of many generations, and express the opinions of a considerable section which prefers to rely on ready-made, current wisdom. All phases of social, political, religious, and domestic life are as a rule reflected in them. But each single saying does not necessarily represent the opinions of the whole nation that produced it. Some may be confined in their circulation to certain trades, professions, and localities, and express the views of those small minorities. Only when a number of proverbs, much in vogue, point in the same direction, can we accept them as representative of national opinion.

There are a number of popular sayings about the proverb itself, all of which show in what great respect it is held by the people in Russia. Sayings such as: "The proverb tells everyone the truth," "No proverb is ever used in vain," "Silly talk is not a proverb," "An old proverb is indestructible," serve as illustrations of this.

A number of Russian proverbs have their equivalents in English and other languages, the thoughts being alike, but the expression differing in form. "More haste, less speed," becomes in Russian "Hurry, and you will become ridiculous." The English "In the land of the blind, one-eyed people are kings," has its equivalent in "Where there is no fish, even crabs are fish."

The Revolution of March 1917 came as a great surprise to everybody who did not know Russia. That such a complicated and extensive system of government should have crumbled down in the course of a few days, involving the loss of a few hundred lives only, was considered nothing less than a miracle. This miracle is to be explained only by the very low esteem in which officialdom and bureaucracy were held. Their corruption and dishonesty were proverbial, and in the day of their trial, not a hand outside of their own ranks was raised in their defence. Sayings such as, "When money speaks, truth is silent," "Money opens all doors," "Don't say a word, let your money speak," "He is right for whom money pleads," are fair comments by the populace on its administrators.

Russians are very religious. There are many proverbs demonstrating their unbounded faith in the Supreme Ruler of the World, and the necessity of prayer on all occasions and in every circumstance. But while religion is held high, the clergy come in for a great deal of criticism. "The eyes of the parson are envious and his hands grabbing," or "The parsons are skinners: they skin the living and the dead," may serve as examples of many disrespectful allusions to representatives of the Church. The monks fare even worse. "Beware of the forepart of an ox, the hind part of a mule, and all sides of a monk," is not in the least complimentary.

Proverbs which indicate the popular view of private property are of interest in view of the attempts made by the Bolsheviks to abolish it, and substitute national ownership of the means of production and distribution. Proverbs such as "Every man is a king in his own house" indicate the complete right exercised by the owner over his property. The landowner had full right to all that came from the land; "Whose land, his corn," or "Whose forest, his timber," show the popular view on the question.

The general view was against leaving money to one's children. The dictum of the late Mr. Carnegie, "I would rather leave my son a curse than a dollar," had several precursors in Russian folk-sayings. "Don't leave money to your sons; the silly will squander it, while the wise can make their own," expresses in somewhat milder form the same idea; while "That is not property which one inherited from one's father, but what one earned oneself," expresses the same idea from a different point of view. The popular belief that what is easily acquired (or inherited or won) brings no luck is also expressed in many sayings.

Unlike in England, the inheritance is as a rule divided equally amongst the sons. "Where there are two sons, all is divided." It is also of interest to note that the youngest, and not the eldest, son inherits the house, making suitable cash adjustments to his brothers.

The saying, " The youngest son remains on the stem," illustrates this.

Private property in personal articles and effects is held in esteem, and no one should violate the eighth commandment. " God will punish him who steals," " Take from others, and you will lose your own," " You will not become rich with stolen property," are popular opinions of the crime against property.

Russians were always an inland race, cut off from the seas by different nations. They had an outlet to the White Sea at Archangel, but that hardly modified the situation. It was not till the beginning of the eighteenth century that Russia secured a footing in the North on the Baltic, and by the end of the same century on the Black Sea in the South. It is therefore natural that the people should have experienced an almost holy dread before that great, mysterious, unknown stranger—the Sea. A number of proverbs point to this fact; " Where there is water, there is misfortune," declares one. Others say: " Far from sea, far from grief " ; " Always expect misfortune when sitting on the shore " ; " He who has not been to sea knows not sorrow," and so on.

Humility is recognised as a national characteristic in the Russian. Great writers like Tolstoy and Dostoyevsky preached it in season and out of season. The proverb also testifies to its efficacious influence. " Humility pleases God, ennobles the mind, saves the soul, and consoles men," is the popular verdict on that quality.

Russians are justly reputed for being very hospitable. " When a visitor is in the house, God is there," declares one adage. Another stamps the unsociable man as " evil." " He is evil who pays no visits and invites no guests." It is an overbold statement, but no doubt it reflects the general opinion in Russia.

As might well be expected, a large number of maxims reflect the well-founded belief in the therapeutic value of diet and the simple life. " Live wisely and you'll need no doctors " ; " He lives long who lives simply," are examples of a large number of sayings dealing with that subject.

Many adages warn against excess in eating or drinking. Some of these express the danger arising therefrom by an arresting comparison: " He who eats when satiated digs his grave with his own teeth," declares one. Another is of the opinion that " One does not die from hunger, but from surfeit," quite oblivious of the fact that hundreds of thousands died in Russia of hunger-typhus during the years when the harvest failed.

A long list of precepts set forth the truth of the good effect on health of a spare diet. " Keep your head cool, your belly in hunger, and avoid doctors, and you'll live to be a hundred," or " Where there is a feast, there is disease " ; while another summarises the situation in " Moderation is the mother of health."

The great value of sleep in resting the body is fully recognised in a number of proverbs. One puts it bluntly in : " Sleep is dearer than father and mother " ; another pays to sleep the great compliment of comparing it to riches : " Sleep, like riches, the more you have the more you want."

But there is an evident danger in too much sleep. It causes laziness, and may bring about the ruin of the peasant's household. " He who sleeps much will have nought " ; " If you lie on the stove you will have to eat bricks," and a number of similar proverbs contain the warning to the peasants of the dangers of sleeping too much.

Idle life is pointed out as the source of ill-health. " The poor man is looking out for disease, while the rich is sought out by it." " Idleness does not feed a man, but only makes him ill," is another truism.

A number of precepts advocate the necessity of being charitable. Charity is considered the essence of true religion. Stories like Tolstoy's *Where Love is, God is*, fully embody this national conception. Also in folk-lore we can trace the same ideal in sayings like, " Don't build a church, support an orphan " ; or " Don't build seven churches, bring up seven orphans." One cannot help thinking, had the whole world been permeated by the principles dominating, to a large extent, the illiterate peasantry of Russia, this earth would now be a pleasanter place to live in.

Books of the Month

The following is our monthly selection of books which we commend to the notice of our readers.

Sir Harry. By ARCHIBALD MARSHALL. (Collins, 7s. 6d.)

Penny Plain. By O. DOUGLAS. (Hodder & Stoughton, 8s. 6d.)

Foolish Lovers. By ST. JOHN ERVINE. (Collins, 7s. 6d.)

Eastern Nights and Flights. By " CONTACT " (ALAN BOTT). (Blackwood, 7s. 6d. net.)

This appeared originally as a serial in *Blackwood's Magazine*.

The Crisis of the Naval War. By VISCOUNT JELLICOE. (Cassell, 31s. 6d.)

A Constitution of the Socialist Commonwealth of Great Britain. By SIDNEY and BEATRICE WEBB. (Longmans, 12s. 6d.)

Splendours of the Sky. By MISS ISABEL LEWIS. (John Murray, 10s. 6d.)

An illustrated book on popular astronomy written originally for magazine readers. Very readable and quite up-to-date.

Philosophy and the Christian Religion. By PROF. C. C. J. WEBB. (Clarendon Press, 1s. 6d.)

A lecture on this subject by the new Oriel Professor of the Interpretation of Holy Scripture, Oxford University.

Relativity. The Special and the General Theory. By PROF. A. EINSTEIN. Translated by R. W. LAWSON, D.Sc. (Methuen, 5s.)

In this book, which is written for the average reader, Prof. Einstein explains his famous theory. Clearly written and admirably translated.

The Birth of Chemistry

By H. D. Murray

Exhibitioner of Christ Church, Oxford

THE science of chemistry may be said to have had its birth in the seventeenth and eighteenth centuries. It is, perhaps, preferable to speak rather of its evolution during this period, since chemistry gradually grew out of the old art of alchemy, which, up to the time of Paracelsus, that is the middle of the sixteenth century, had existed as an art chiefly directed to mean ends and having a close connection with magical practices. This process of evolution began when the old alchemy became raised to a higher status by its alliance with the profession of medicine. Not, however, until nearly 150 years later, when chemistry began to free itself from the limitations imposed upon it by its application to medicine, do we see in it any real growth as a science. From that time up to the latter part of the eighteenth century, when Lavoisier introduced the use of the balance, and so gave to chemistry the form which it now bears, it was dominated by the phlogistic theory. In spite of this, however, the latter period was rich in discoveries and fruitful hypotheses.

In order to understand the world of thought in which the science of chemistry was born, it is necessary to study first the legacy of the alchemists to that world. Their knowledge, which was largely empirical, had its origin in Egypt. The two great theories which coloured all their views were the belief in the transmutation of metals and in the existence of the philosopher's stone. To the latter were ascribed many properties, which varied from time to time, some of them—such as the prolongation of life—partaking of a magical nature. A full account of these properties, stated in less extravagant and obscure terms than those used by Paracelsus and others, is given by Andreas Libavius in his *Alchymia*.

The views of the alchemists as to the constitution of matter were largely founded upon those of the ancient philosophers. The latter recognised in the world four distinct principles—solidity typified by the earth, wetness by water, combustibility by fire, and the gaseous state by the air. The alchemists, however, directed their attention chiefly to the first three principles or elements, using the word probably in a different sense from that used to-day. This may have been due to their very scanty knowledge of gases, which were usually neglected in reactions, and were only classified as combustible and non-combustible. They were all known by the generic term of air. Basil Valentine put forward the view that all substances consist of three elements—sulphur, mercury, and salt—in varying combinations, and the idea received considerable support. Although general knowledge of chemical reactions was small, metallurgy, extraction from ores, and formation of alloys had been more thoroughly studied, both from the utilitarian point of view and as being the readiest point of attack in the problem of the transmutation of metals. In this latter connection, the properties of acids and their action upon various substances were also better known; in aqua regia they thought to have found the long-sought *alkahest*, or universal solvent. There is a tendency nowadays to believe that the knowledge of the alchemists was greater than that formerly attributed to them. Their writings are, however, so very vague and so often full of mystical terms that it is easy, in the light of our present knowledge, to read into some sentence a meaning which, from other sources, we find the writer never intended.

Alchemy may be said to have received the first of the blows which eventually killed it in the teachings of Paracelsus. It is true that he was a firm believer in the transmutation of metals, but we find such alchemistic views occurring even up till the nineteenth century. Dippel, who lived in Berlin early in the eighteenth century, is known traditionally as the last of the alchemists; but the last great chemist to support many of the alchemistic ideas in his teaching was Boerhaave, who died in 1738.

The period dating roughly from the middle of the sixteenth century is known as that of the iatrochemists, and is marked by the attempts made to fuse chemistry and medicine. Paracelsus, and later de la Boë Sylvius (1614–72) and Tachenius, Sylvius' pupil, were the leaders in this attempt. Although we see little advance in actual knowledge during this period, yet chemistry can be said to have continued its evolution,

in so far that it was raised from the disrepute into which it had fallen, through the charlatanism of its followers, to the status of a subservient branch of medicine.

The basis of iatrochemistry was the application to the human body of the statement that all substances consist of one or more of three constituents. Paracelsus, for instance, considered that all disease was caused by a preponderance of one constituent. Health could be restored by removal of this excess by suitable medicines. This theory was responsible for a large number of experiments to determine the physiological action of different substances, usually metallic derivatives and alkalies. The word alkali was first used by Van Helmont (1577–1644) in its present sense. Sylvius suggested that the corrosiveness and sharpness of alkalies were due to the fire-stuff taken up during their preparation, this being usually effected by calcination or by boiling with lime. Tachenius first defined a salt as the compound of an acid and an alkali. The iatrochemists were concerned more with the application of chemistry to the workings of medicine than with advance in the science of chemistry. We find, therefore, that any such advance which took place in this period was rather in the recognition of new substances, and an examination of their action upon the human body.

The next distinct period in the history of chemistry dates from the beginning of the eighteenth century, when Stahl (1660–1734) formulated his famous theory of phlogiston. He considered that the property of combustibility is dependent upon a constituent of all combustible bodies, to which he gave the name phlogiston (from φλογίστεω, *set on fire*). This constituent could pass from one body to another; addition of phlogiston to some substances could, for example, be obtained by the action of what we should now call a reducing flame upon them, or by heating one body with another which readily parted with its phlogiston. Accordingly, he believed metals to be compounds of metallic oxides with this hypothetical phlogiston. A difficulty arose when it was found that a body was lighter after the addition of phlogiston than before. This was met by the more ardent supporters of the theory by saying that the laws of gravitation were reversed in the case of phlogiston; in fact, its weight was a negative quantity.

The period of phlogiston contained many great chemists, of whom, possibly, Boyle, Scheele, Cavendish, and Black were the most prominent. Boyle is famous for his work upon gases and the well-known law deduced therefrom. He was, also, the first chemist to define an element as a substance which can enter into combination, but which itself cannot be decomposed. Scheele discovered chlorine and investigated its properties. To Priestley is the credit of many experiments upon gases, in the course of which he discovered oxygen. The work of Black upon the alkaline earths was important since it showed where the difference lay between caustic and mild alkalies. He proved that the former were alkali oxides, and the latter, carbonates. Black also investigated the properties of carbon dioxide given off during these experiments. In view of these advances it is strange to find that, until Lavoisier definitely disproved it, the belief in the conversion of earth into water and similar processes still flourished. In this, and in Stahl's theory of phlogiston, we are reminded of the older theory of four distinct principles or elements in matter, which we find occurring in every part of the world and which seems to have existed from time immemorial.

In spite of the almost universal acceptance of Stahl's erroneous theory, the science of chemistry greatly increased during the period of the phlogistonists. For the first time chemistry was established as a real and independent science. The foundation-stone was laid upon which the structure of chemistry as it is known to-day is built, that structure which the genius of Lavoisier did so much to rear and which, as we regard it, should remind us of the labours of those who worked with such endurance and with so little visible reward.

The Psychological Examinations in the American Army

By Walter Veazie, Ph.D.

Instructor in Philosophy, New York University; 2nd Lieut., Inf. R.C.

How does the native intelligence of carpenters compare with that of doctors? Is there any psychological basis for the division of society into classes? Is mental retardation ever due to poverty and lack of a chance? These are questions of vital importance to any theory of social reform, and they are questions which have acquired a new significance as a result of the psychological census taken in the American Army.

To classify, conserve, and develop her man-power the army called in those scientists especially concerned with the mind, psychologists and educators, whose privilege it was to examine a large and miscellaneous, if not entirely unselected, sample of the population, and to make a canvass of the country's brain-power such as has never before been taken. Whatever may be our doubts as to the value of the tests in determining individual cases, the summation of their results is both

interesting and instructive. These results are now being made public.

The specific problems which the military authorities faced were the selection of the right man for the right job and the disposition of draftees of very low intelligence. In the old army promotion came after long observation. A man rarely got his stripes until well on in his second enlistment period, while a soldier must have served six years as a line sergeant before he was eligible for promotion to ordinance sergeant. In the new army, on the other hand, sergeants were literally made over-night, so that the need of a quick and ready method of judging men was imperative.

Feeble-mindedness: A Social Problem

The proper disposal of men of very low intelligence was an urgent need. Many draftees of such a degree of feeble-mindedness as to constitute not only useless consumers of food, but a positive menace to military efficiency, were sent home to continue in the simple tasks from which they had been taken, while men of intermediate grade were segregated into special organisations for special work adapted to their abilities.

Feeble-mindedness is a state of arrested mental development, due to an original lack of the power of mental growth beyond a certain level. The primary causes of such arrested development are far from being adequately understood, but an unstable or diseased nervous system in the parents may certainly be considered among the most important.

Having reached a certain stage of advancement, the feeble-minded cease to develop, and this stage cannot be raised by any known methods of education. This fact of the hereditary foundation and apparently irremedial nature of mental deficiency is of the greatest importance in considering problems of education and reform.

Three classes of the feeble-minded are ordinarily recognised: (1) idiots, those persons lacking the ability to protect themselves from ordinary physical dangers; (2) imbeciles, those able to see to their physical wants and do simple, routine tasks, but unable to bear the responsibility of looking after their general welfare or of providing for themselves without constant supervision; (3) morons, or those who, assuming full responsibility for their actions and livelihood, are of inferior judgment and unable to progress in school or industry—the ne'er-do-wells and the dullards.

For the care of idiots and imbeciles society assumes responsibility, and the problem is rather financial than social; but the moron is not recognised either legally, medically, or industrially as being different from the rest of us, and he accordingly constitutes the greater social problem. From among this class are recruited the greatest percentage of chronic failures, of prostitutes, of criminals—those persons unable to judge the natural consequences of their acts. As feeble-mindedness is inheritable, the moron, marrying or otherwise propagating his kind, gives to the country generations of undesirables and paupers, a menace and an expense to the State.

The problem in the army was very similar to that in society in general. Idiots, of course, never leave asylums, but the army did receive many middle- and high-grade imbeciles. They were easily recognised, however, and generally disposed of, although military policy was far from uniform on this point. The real trouble began with the moron. The moron formed a weak link in the organisation; he was unteachable and highly expensive, demanding continual supervision; in actual service he was entirely unreliable.

Psychological Tests

"Early in the emergency," says the report[1] given under the authority of Major Robert M. Yerkes, "it became clear to psychologists in the military service that the fundamental psychological problem of the army is one of placement, and that the most important service psychologists could possibly render would be to assist in so assigning every soldier that his mental (as well as physical) ability should be used to advantage. It was assumed by the psychological personnel that intelligence, alertness, the will to win, enthusiasm, faith, courage, and leadership are even more important than are physical strength and endurance, and that this fact must be scientifically reckoned with wherever a strong military organisation is to be built quickly. Very promptly it became the recognised purpose of army psychologists to assist in winning the war by the scientific utilisation of brain-power. The achievement of this purpose necessitated the preparation of special methods of mental measurement in order that recruits should be properly classified for elimination or assignment to military training."

These special methods of mental measurement, however, are based in principle upon the intelligence tests devised by two French scientists, Simon and Binet, to detect and classify backward school children. Simon and Binet undertook to construct a scale that would measure the native intelligence of any child and indicate whether he were normal, precocious, or retarded, and *to what extent*. By this scale a child would be given a mental age which might or might not correspond to his chronological age.

The principle on which these tests were constructed is as follows: Take the ability to count thirteen pennies. They found by experimenting on Paris school children that most of those six years old could count thirteen pennies, so counting thirteen pennies

[1] *Science*, 1919, N.S. vol. xlix, pp. 221 *et seq.*

was accordingly considered a test for six-year mentality. The majority of children of six could also repeat a sentence of sixteen syllables, could correctly name the four principal colours (red, yellow, blue, and green), could follow out three simple directions given together, etc.

In selecting their tests, Simon and Binet aimed to avoid recording the effects of education and to get at the development of *native ability*. The tests were framed to cover memory, attention, discrimination, reasoning, and other mental processes. That group which was passed by the majority of three-year-old children was taken as measuring a three-year mentality, and so on for all the years up to eighteen, the mental age of a superior adult. If a child five years old was examined and passed the six-year tests (or their equivalent in scattered tests), he was considered as of superior intelligence, being a year in advance of most of the children of his age. On the other hand, if he failed to pass the five-year tests and only succeeded with those for four years, he was backward and called for special attention.

A classification of feeble-minded adults can in this way be made on the basis of mental ages. An idiot may be defined as one with a mental age of two years or below, an imbecile as one with a mental age of at least three years and less than eight years, and a moron as one whose mental age is between eight and twelve.

It was, of course, obviously impossible to give an individual psychological examination to every draftee as he entered our gigantic forces, so the psychologists set themselves the task of adapting the examination to a form that could be given to a large group at one time. Tests similar to those of Simon and Binet were printed on a form to be filled out by the examinee, and the necessary directions were read to large groups of from fifty to several hundred in special buildings or Y.M.C.A. auditoriums.

One difficulty was the large number—larger than was expected—of non-English-speaking and illiterate soldiers who were unable to read or write the tests. This eventuality was provided for by a series of performance tests, corresponding results being arrived at through the subject's performance of acts not requiring language. A collection of these performance tests was also adapted to a printed form, and the directions given through the performance of similar tasks in pantomime by an assistant.

General Results in the Army

The specific uses made in the army of the results of psychological testing need not detain us, especially as they are a matter of controversy. In brief they were: (1) aid in selecting men for special training and for officers' and non-commissioned officers' training camps; (2) standardisation of companies, to prevent one unit of a regiment containing a higher percentage of low-grade men than another; (3) elimination of the very low grade or their assignment to special organisations; (4) special disposition of disciplinary cases.

Beyond these practical applications of psychological ratings in the army organisation, generalisations of possibly wide import as to the intellectual structure of the American people have been revealed. Professor E. L. Thorndike, in his vice-presidential address before the American Association for the Advancement of Science, gave a review of the median scores made by men of different occupation groups (previous to entering the army). The lowest group consisted of farmers, labourers, general miners, and teamsters, while the highest contained army chaplains and engineer officers. Between are ranged, in ascending order, general trades (as carpenters, bricklayers), higher trades (as mechanics, tool-room experts), and clerical occupations (as general clerks, book-keepers, typists, accountants).

This list marks a distinction in intelligence rating between those who work with their hands and those who work with their heads, and indicates that the more intelligent naturally gravitate to office and clerical jobs, whereas the less intelligent choose or stagnate in the trades. As Professor Thorndike remarked, "The matter is one of great importance. In proportion as it is true that the more intelligent men seek clerical work rather than work in skilled trades, an essentially invidious class distinction will tend to have a real basis in fact; and the management of business concerns will tend to fall into the hands of men trained in the office and salesroom rather than in the shop."

A similar classification of army officers of the different corps is presented by Major Yerkes. These officers' ratings are headed by engineers, field-artillery, trench-mortar, and personnel adjutants, and end with medical, supply-train, dental, and veterinary officers.

With regard to the population in general, the percentage of illiteracy was much higher than we had been led to expect. If a man said he had attended school three or four years and could write his name, it has been customary to consider him as literate, but by the time he reaches twenty-one he may be unable either to read or write. On the whole, one who has not attended school beyond the fifth grade is illiterate for all practical purposes. This is particularly true of the negroes, so that companies of the latter were at times 90 per cent. illiterate.

The "average" intelligence of the army proved to be well below fourteen years mental age, although just where it will fall has not yet been made public. The average for illiterates was, of course, below the general average and probably not far from eleven years. About 2·6 per cent. of the total number of men examined gave

a mental age *under* ten years, and in this connection it must be remembered that the very lowest were never drafted into the army.

The Negro [1]

"The comparison of negro with white recruits," writes Major Yerkes, "reveals markedly lower mental ratings for the former. A further significant difference based on geographic classification has been noted in that the northern negroes are mentally much superior to the southern."

The results in the case of the negro may revive the discussion of a few years past as to the negro's racial status. Certain anthropologists attempted to show the anatomical inferiority of the negro brain and the general inferiority of the race. Negro children were said to be arrested in their mental development at a lower level than white children, and, after the analogy of the feeble-minded, this arrest was considered inherited and irremedial. Professor Franz Boas, one of America's foremost ethnologists, pointed out at the time the dubious nature of much of this investigation and demonstrated that the status of the negro in America may be quite as probably due to environmental features. "It may therefore well be," he wrote, "that if there is any truth in the retardation and final arrest of development of the negro . . . this may be due to the greater poverty and the more frequent ill-nourishment of the negro child." "We must remember that the negro race in our country has been torn away from its historical surroundings, that it has been placed in a new country, and that in this country it has never been in a position of true independence." A confirmation of Professor Boaz's view would seemingly be indicated by the psychological census. The marked mental superiority of the northern negro is certainly not due to a racial difference, nor is there a greater intermixture of white blood in the northern branch. We can apparently conclude then that, given better social, economic, and educational conditions, the North American negro will become a very different person from what he has been, or been made, in the past.

The negro of standard low intelligence, as he came into the army clinic, gave the impression of having a very different mental make-up than the feeble-minded white. As one examiner put it, the negro seemed "normally abnormal"; he was not peculiar but dull, seemingly at home, and well able to take care of himself in spite of his low intelligence. There was also a much less careful selection among the negro recruits by the draft officials, who sent to the camps negro low-grade imbeciles—candidates for asylums. I saw two with mental ages of four years.

[1] *Cf.* M. R. Trabue, "The Intelligence of Negro Recruits," *Natural History* (Jour. Amer. Museum), 1919, vol. xix, p. 680.

The Need of Varied Types of Education

The very varied standards of mental endowment, indicated by the classification of test ratings for the different occupations, would lead us to an educational policy diametrically opposed to the educational levelling universally practised and frequently advocated by politico-educational philosophies. The greater number of our youth to whom educational opportunities are open never proceed beyond the eighth grade or early high-school years, and the reason is probably to be found in the fact that they are not capable of undertaking or adapted to the traditional intellectual discipline. If the average man who will become a carpenter differs in quantity and type of intelligence from the average man who will become an accountant or a clergyman, the former should be given an opportunity to obtain an education beyond the three "R's" adapted to his own mentality. It is particularly important to recognise these differences at the present time, when certain States and Governments are about to make school attendance compulsory up to the age of eighteen years. After a certain stage in the 'teens the youth can no longer be made to conform to the education; the education must conform to its material.

Political and Industrial Classes

Is there any natural basis for the universal division of society into classes? If we accept the results of the psychological investigation in the army at its face value, assume that people for the most part marry within their own class, and remember that mental inferiority is hereditary and with cross-breeding cumulative, we might draw a gloomy picture for the so-called "lower classes," analogous to that drawn by the Austrian economists on economic grounds. There certainly is authoritative evidence—of which certain "poor whites" of the southern mountains may be an example—that a restricted intermarrying group of low stock will maintain its inferiority and even deteriorate. However, as regards strata of society, especially in a country like America, no such conclusions are in the least warranted. Outside of a few would-be blooded aristocrats in certain centres there are no marriage groups, but, on the contrary, a constant movement both up and down. Psychological investigations made in several countries to determine the relative intelligence of children from the different social classes have given results slightly in favour of the "upper classes," but not sufficiently marked to warrant any conclusions respecting the next generation.

However, this phenomenon of social "currents" as well as "classes" indicates a fact which we traditionally hate to face in this country since the advent of Jeffer-

sonianism, namely, that in a cross-section of our population at any given time one will find social and economic strata which are indicative of differences in intellectual endowment more than of family connection. I said, since Jefferson, for the Revolutionary fathers—as we have generally forgotten, thanks to high-school textbooks of American history—took this intellectual stratification for granted, assuming that an intellectually upper class would rule the country to the country's good. A great deal of contemporary political philosophy goes out of its way to denounce this view as well as all other social structures to the point where some of our Bolshevik friends seem to advocate a government by, of, and for the feeble-minded.

Future of Psychological Testing

Many, if not all, psychologists entertain no delusions as to the intrinsic value of the mental tests now in use. The tests are in an embryonic state and the results as applied to any particular individual are always open to question. Their use in educational institutions is, nevertheless, continually on the increase, not only for the detection of feeble-minded and backward children in the grades, but for determining specific qualifications. Witness the optional substitution at Columbia University of psychological ratings in lieu of the customary entrance examinations in the case of applicants coming with acceptable papers from secondary schools.

The problem of the psychologist, however, in co-operation with the anthropologist, is much larger than mental tests. It is for him, if possible, to mark the limits and limitations of the classes (not necessarily the present classes) of our population, so that social and political reform can deal with something besides sentiment and humanitarianism. In what directions the results may point it is neither my purpose nor power to indicate, but, to take an example, reformers have failed to recognise that an argument for Government control (or protection) over the relations between employer and employee may be based on the relative mental inability of the latter to deal with the economic situation on a par with the "captain of industry," as well as on the basis of general "cussedness" and class hatred.

Not the least of the psychologist's duties is an eugenic problem, the determination of the causes of feeble-mindedness, its relation to other diseases (such as tuberculosis) in the parents, and its inheritability. In this way he may assist in its elimination or possible alleviation. Our present knowledge on these points is most fragmentary and inaccurate. Psychologists may contribute much towards a better knowledge of the human race, without which reform becomes riot and progress a whirligig.

The Study of Athletics and Sports by the Movies

By Ernest A. Dench

Author of "Making the Movies"

In real life athletes accomplish their feats at such a rapid pace that a close study of their movements is out of the question.

Photographs have been suggested and tried as a way out of the difficulty, but it is seldom possible to catch a motion at the psychological time, while the motions themselves would not be of the continuous variety.

Motion pictures offer an effective solution. To obtain films true to life, they must be taken at the rate of sixteen "frames"—or pictures—to the second. There are sixteen of these frames on a single foot of film, or sixteen thousand in the case of a one-reel production.

Therefore, under these conditions, the study of athletics is just as far off as before. The only solution is to slow up the movements, which may seem an impossible task were not the motion picture so versatile.

Cinematography reverses many things, so a number of athletic games like running, jumping, and throwing the weights, were filmed at the rate of one hundred frames to the second—a feat accomplished by a motor attachment to the camera. In the studio is a peculiar kind of clock called a "chronoscope," and it is introduced in order to show the time which elapsed between each motion. It contains but one dial, which is operated by clockwork. The face is divided up into twenty sections, each one of which represents one-twentieth part of a second. The chronoscope is set in motion immediately the camera man turns the crank, and continues until the motion has been completed. The film, when seen on the screen, is projected at the normal speed. The results amaze, when the two methods are contrasted; although the hurdler travels as fast as an express train, he is made to walk along at the pace of an old man. When he leaps the hurdle, he is as graceful as a bird.

Harvard College, U.S.A., has adopted the film as part of its athletic training. The work is in charge of Percy Haughton, the football coach, who has had films taken of the teams at work. He has already been able to trace the weak points of his men to their source.

In baseball, the New York National League has utilised the motion picture to stamp out all useless motions. With this object in view, pictures of the

players in action have been taken. These are diligently studied, and the speed in which amateur and professional pitchers, catchers, batters, and basemen work is therefore available. The method is so scientific that the exact time a pitcher takes in the wind-up, the speed of the pitched ball, the angles assumed by its curving, and how long the batter is in finding out he has banged it and in making a start for the new base, the precise period the catcher takes to recover after taking the pitched ball, and then to run 129 feet along the course trying to put out the runner speeding from the first base to the second—all these things are revealed.

As to horse-racing, a French trainer has discovered that it is instructive to visit the kinema theatre in order to see the races in which one or more of his horses have run.

In 1914 there was a dispute over the Derby. "Bumping" and "boring"—foul play on the part of the jockeys—occurred; but many disagreed with the steward's decision, who stated that it did take place, and disqualified the favourite. The motion picture, however, had recorded all these incidents, and thereby proved its worth as an impartial judge.

In boxing, too, champions have found it instructive to have their efforts recorded on the film, and self-criticise them when later thrown on the screen.

In England, not so very long ago, an attempt was made to instruct the amateur golfer in regard to the correct way in which to play his strokes. Accordingly, several famous golfers posed for a bunch of snapshots, but when these were put on a mutoscope machine in rotation, it was found that they lacked continuity.

But all shortcomings were obviated when J. A. Taylor, five times world's golf champion, consented to give a demonstration for the film, by which it was possible to follow every movement of the body, with the start of the swing back until the follow-through was over. The predominant features of the pictures were the champion's marvellous driving and his excellent "putting" and "stymie" strokes. Several close-up views served to show clearly the right positions the hands and feet should be in.

One peculiar thing about cinematography is that an ordinary quick movement appears ridiculously rapid when the film is shown on the screen. For this good reason, Mr. Taylor did not work with his customary pace, but slowed down in order that his actions would get over effectively. The film, which only took fifteen minutes to show, taught the amateur more than he could have learned in weeks by any other method.

I am also informed, on very good authority, that several professionals, when "off colour," find the motion picture highly instructive.

Tactics Adopted in Filming Wild Birds

By Ernest A. Dench

Author of "Making the Movies"

WHEN we get down to nature, as we often do at vacation time, we can't approach sufficiently near to the wild birds for any length of time to study them at first hand. As soon as we come in sight, the songsters fly off to the boughs of some stately tree.

So when we see on the movie-screen some remarkable close-up views of different birds, we pause to wonder how the camera man got the studies unobserved. Maybe a suspicion of doubt passes through our minds. Well, this article is to assure you that there is no faking—the cinematographer succeeds by reason of his own resourcefulness.

Edward A. Salisbury, who has put America on the natural-history-film-map, recently wanted to secure some snappy views of the eagle, so he climbed up an exceedingly tall pine-tree, struggling gamely with his camera, which turned the scale at eighty pounds. To guard against possible attacks on the part of the mother-bird, he carried a nasty-looking stick. It proved, however, no easy task to fix the camera in the top boughs of this majestic forest tree, so he tried one way after another until the machine would keep in position. When he succeeded in doing this, he had the utmost difficulty in coaxing the young eagles to remain in their nests.

To obtain a film study of herons, he made screens out of vegetation growths picked from a tract haunted by the birds. These screens were so cleverly arranged to match the undergrowth that even Mr. Salisbury, on returning the next morning, wandered for over an hour before he could locate his hiding-place. He was soon rewarded, however, by two male birds appearing, and while they indulged in a scrap *à la* Jack Johnson, he turned the crank of the camera.

Imagine, then, his disappointment, when developing the negative, to find a blade of grass had obstructed the view of the lens.

It is a distinct feather in the cinematographer's cap to "capture" the kingfisher, that shy British bird. I happen, however, to know of one camera man who attempted the difficult stunt. He went about it by studying the haunts of the kingfisher for himself. This completed, he took up quarters in a stream at a place where the water was four feet deep. Over his head and shoulders he placed a large mask formed of tree branches. When a kingfisher ventured within view, he moved cautiously, so as to deceive the bird

into thinking that the boughs were being floated by the current.

And where was his camera? That, let me tell you, was under his sheltering contrivance fixed to an anchored floating base. His first filming effort was a failure, for the camera's clicking frightened the bird away.

But one futile attempt did not daunt this enterprising young man, for he next procured another camera and attached it to the same floating base. Day after day he waited for the regular appearance of his victim, when he turned the handle of the second camera, which was without any film. This went on for seven weeks, at the end of which time the kingfisher had learnt to pay no attention to the working of the motion-picture machine.

All he had to show for his untiring efforts was a strip of film two hundred feet in length. Snappy, it is true, but it was run off the screen in two minutes.

Some British birds are cliff-dwellers, and this adds an element of danger to the work of the motion-picture photographer. He usually works with a tripodless camera, and has himself lowered down a tall cliff on a rope. The extra powerful lenses are handy for approaching the birds at a distance unawares.

Equally tedious to film are those birds that favour the ground for building their nests, for, apart from the fact that considerable skill is required to focus the apparatus in the right-angle, it is hard to "snap" the feathered creatures off their guard.

Rubber Tree Diseases

Rubber shareholders are, as a rule, more concerned with the purely commercial aspect of the industry than with the scientific side, but for those who care for such things there is a wide field of interest opened up by some of the technical features of the industry. How little is really known about the growth and origin of rubber is surprising, and knowledge of the real functions of the rubber tree and the production of latex is still in a very undeveloped condition.

Among the numerous questions that arise in connection with the origins of latex and other fundamental problems of the industry may be asked, "What is the particular function of the latex in the life of the tree?" The only answer is that nobody knows. That the rubber tree is related to the terpene family and that the production of latex has a family relation with other resinous substances is known, but apart from this the real function of the secretion is still unknown. Yet it is obviously essential that, in the best interests of rubber cultivation, this primary function should be understood. The need for increased research work in an industry which now employs some £80,000,000 of capital is very apparent. Planters are very apt to work by rule-of-thumb methods. How many planters have any real knowledge of the intrinsic differences between good and bad yielding strains of trees at the date of planting? Yet close research into the qualities which differentiate the good yielders from the bad, with the possibilities of selection which could then be exercised, might well have the effect of doubling the yields from any given area. Not many people outside those immediately interested know that the laticiferous tubes in the cortex of the rubber tree are arranged diagonally, so that the choice of the tapping cut from left to right, or *vice versa*, may make a vast difference in the yield, owing to the number of tubes intersected by the cut.

When the number of diseases and enemies to which rubber trees are subject are considered, the casual observer is inclined to wonder how rubber trees manage to survive at all. It is something like the study of a medical treatise, from which the reader can easily persuade himself that he has symptoms of almost every known complaint. Fortunately, however, as in the latter case, all diseases do not attack every tree or every plantation at once. To-day Brown Bast easily takes first place among the enemies of rubber plantations. So far as the general public is concerned, this is practically a new disease, and it is instructive to note that no reference to it is found even in the later treatises on the subject. In point of fact, however, it has been known for many years, but only recently has attention been drawn to it to any considerable extent. In the old days when plantations were closely planted, it was a simple matter to eliminate altogether trees affected with this fatal disease. With the wider planting now generally practised, however, every tree counts for a tree, and, as every rubber shareholder knows, the question has recently assumed considerable prominence.

The first sign of brown bast is a big increase in the latex yield of the tree affected, but this soon diminishes and ultimately ceases altogether. The bark discolours and hard burrs appear, and, if the disease is neglected, the tree becomes useless. The disease is very prevalent throughout the East, few estates having less than 5 per cent. and some as high as 60 per cent. of their trees affected. Curative methods, such as resting, liming, and manuring, have been tried without success, and the only remedy known so far is that of stripping the bark from the portions attacked, afterwards shading the cambium[1] until a new growth of bark has developed.

[1] The cellular tissue which lies between the wood and the bark.

It is obvious that a disease of this kind is likely to exert a powerful influence on over-production, and should no remedial measures be found, its increase at the worst might involve wholesale replanting of trees in from fifteen to twenty years' time.

Up to quite recently brown bast was described as a physiological disease of the tree, the term in reality being only a confession of ignorance as to its true nature. It was supposed to be due to the effects of tapping, and has been compared with anæmia in a human being. Recently, however, a mycologist in Sumatra claims to have isolated a definite bacterium to which the disease is due, and should further research support this discovery, the search for a remedy would appear not to be hopeless since the cause is known.

Among other diseases with which estates are troubled may be placed in order, after brown bast, the well-known fomes, ustelina, pink dieback, striped canker, and a new enemy called patch canker, while it is well known that any diseased wood is liable to attacks from white ants. Apart from brown bast, however, which has so far defeated the best efforts, most of these diseases are well understood and can be adequately treated if taken in time.

Sir William Henry Perkin, F.R.S.

March 12, 1838—July 14, 1907

The Discoverer of Mauve, the First of the Aniline or Coal-tar Dyes

The keynote to the life of the discoverer whose short biography we give this month has been sounded by himself in the words "Research was my ambition." Born in London, the son of a builder and contractor, he was educated at a private school and then at the City of London School, being intended by his father for the profession of an architect. While still at school, however, he exhibited an unmistakable leaning towards chemistry, devoting the lunch hour to attending lectures on this subject, not in those days included in the usual school curriculum. At the age of fifteen he entered the Royal College of Chemistry under Hofmann, whose honorary assistant he became two years later. His first piece of research work under this distinguished teacher, though it resulted in failure through no fault of his own, led to the preparation of anthraquinone, the parent substance of alizarin, from anthracene, which in itself would have been no mean triumph had he been able to appreciate the significance of what he had done. It must be remembered that at this time organic chemistry was in its infancy, and there was no theory to guide the worker as to the results obtained in the laboratory. His first successful piece of research was completed in 1855, when he was but seventeen years old, and he was then promoted to the Research Staff under Hofmann. It was here that he formed a friendship with Professor A. H. Church, with whom he afterwards collaborated, and it was while in this position that he made his great discovery of Mauve, and laid the foundation-stone of the coal-tar dye industry. As Meldola has so well expressed it, "Seldom, if ever, in the history of science has the discovery of one chemical compound of practical utility led to results of such enormous scientific and industrial importance as this accidental preparation of Mauve in 1856." This discovery was made by a lad of eighteen. Such an ardent research worker was Perkin that the time spent in Hofmann's laboratory was not long enough, and he accordingly fitted up a room in his father's house at Shadwell, and there pursued his researches, independently of Hofmann, in the evenings and during the holidays. Here it was that he and Church produced a reduction-product of dinitronaphthalene, the first of all the azo-dyes, though the true nature of this substance only became known to the discoverers seven years later, when the first patent was taken out claiming a sulphonated-azo colour in 1863. The discovery of Mauve was an accident. Perkin, in the Hofmann Memorial Lecture, has told us how he was "ambitious enough to wish to work on this subject of the artificial formation of natural compounds," and it was in an attempt to prepare quinine artificially that he got "a dirty reddish-brown precipitate."

Nothing daunted, he tried again with aniline, and this time obtained a very dark-coloured precipitate, which was found on investigation to possess the properties of a dye. The discovery of Mauve diverted Perkin from the field of pure to that of industrial chemistry. He left Hofmann's laboratory and, against his teacher's advice, determined to set up a factory and prepare his new dye on a commercial scale. It is hard to realise to-day what this meant in 1856. Everything was pioneer work. The raw products had to be obtained from coal tar on a manufacturing scale. The kind of apparatus and machinery had all to be invented. This was the first artificial colour factory the world had ever seen, and yet such was young Perkin's faith in his discovery that he induced his father, not only to put up the factory, but to sink practically all his capital in an undertaking which must have seemed to him little short of sheer madness. A site was found at Greenford Green, near Sudbury, and there, in June 1857, building operations were commenced. Six months later the

new dye, under the names of "Aniline Purple" and "Tyrian Purple," was supplied to one of the London silk dyers. The difficulties overcome in the production of the dye were as nothing to those still to be encountered in inducing the diffident manufacturer to use it.

The silk dyer, the cotton dyer, and the printer of calico had each to be tackled in turn, and it must be confessed that the French were quicker than the British in grasping the meaning of the new discovery. In a lecture before the Society of Arts in 1868 Perkin tells us of his difficulties: "I distinctly remember, the first time I induced a calico printer to make trials of this colour, that the only report I obtained was that it was too dear, and it was not until nearly two years afterwards, when French printers put aniline purple into their patterns, that it began to interest English printers." Through some technical error in the British patent, they were able to manufacture the dye independently. The name Mauve itself originated in France, and it was the importation from France of calicoes printed with the new colour that made the British manufacturer wake up. The new industry thus created immediately influenced pure science, and even Hofmann himself entered the field of tinctorial chemistry.

Perkin did not allow his interest in the technical side to interfere with his passion for research, and though the far-reaching importance of the discovery of Mauve is apt to eclipse his other discoveries, these nevertheless were great enough to hand his name down to posterity. One of them, in fact, has done so, for the "Perkin Synthesis" by which he was able to prepare coumarin, the odorous substance contained in the tonka bean, still bears his name. It is worth noticing that this was the first artificial perfume to be prepared from coal tar.

With Duppa he carried out researches of the greatest importance synthesising glycocoll, a substance hitherto only known naturally. His synthesis of cinnamic acid from benzaldehyde enabled Baeyer and Caro subsequently to prepare artificial indigo. The discovery of artificial alizarin by Graebe and Liebermann set Perkin to work to find a practical method of manufacturing the dye on a large scale, an effort which was crowned with success simultaneously with his German competitors, Perkin being granted a patent for his process on June 26, 1869, one day after the German patent of Caro, Graebe, and Liebermann had been secured. Artificial alizarin has now completely displaced the natural product and put an end to the madder-growing industry. The Greenford Green Works at once started producing artificial alizarin, first in a small way, and then in ever-increasing quantities, long before the Germans made use of the

[*Continued on p.* 282

discovery. By 1874 Perkin had acquired what, to his simple requirements, seemed sufficient wealth to enable him to retire, at the early age of thirty-six, from his industrial undertakings. The factory was sold, and he set to work to devote his remaining years to the pursuance of his life's desire, Research.

This loss to industry was a gain to science, and there is little doubt that it contributed greatly to the subsequent transference of the dyeing industry from this country to Germany. In 1881 he opened that chapter of physical chemistry which is inseparable from his name by the discovery of the Magnetic Rotatory Power possessed by some of the compounds he had made.

The celebrations of the fiftieth anniversary of the discovery of Mauve in 1906, when the chemists from all over the world met together to offer homage to the founder of the coal-tar industry, must have been rather a trying ordeal to a man of so simple and retiring a nature as Perkin. After this he went on a tour to America, and on his return was just settling down to resume the peaceful course of his studies when an illness put an end to his career. He died while still at his life's work—Research.

EDWARD CAHEN.

NOTE.—The reader is referred to the obituary of Sir William H. Perkin, by the late Professor Meldola, in the *Journal of the Chemical Society*, 1908, vol. ii, pp. 2214–57, and also to the Hofmann Memorial Lecture by Perkin himself, in the same journal, 1896.

Reviews of Books

Conifers and Their Characteristics. By CHARLES COLTMAN-ROGERS. (John Murray, 21s. net.)

The author of this book is the chairman of the Forestry Committee of the Royal Agricultural Society of England. He has a wide experience of trees and a good knowledge of what he is writing about. One gathers, from a reading of the book, that the author is sagacious, far-seeing, and full of humour. He would be a good man with whom to go on a country walk; a good talker too, we should think. But he writes badly. Indeed, he has such a peculiar way of saying what he has to say that we are afraid a great many readers will not be bothered reading him. This is a pity, but so it is.

The object of the book is to help students and others in identifying the many different species of trees included in the category of the natural order of Coniferæ. Cypresses, junipers, cedars, pines, yews, larches, the silver firs and the hemlock and spruce trees, and others, are all described in detail. The descriptions are on the technical rather than on the popular side. At the end of the book a summary of information is given in tabular form, following which there is a glossary of the technical terms used. This is the strongest part of the book, because it is definite, concise, and in a form that is easily consulted.

One feels about this book that it would be all right if only the author would "cut the cackle and get to the 'osses." He adopts at times an anecdotal, chatty manner, digressing apparently merely to be breezy or to make (quite good) jokes. At times he seems to write in inverted commas. One hardly knows whether the journalese he uses is deliberate or not. Imagine George Augustus Sala trying his hand at a style a cross between that of Henry James and the English schoolboy's crib of Vergil, and you have something similar to that frequently adopted in this book. Listen to this in a book about trees. It is taken from the beginning of the chapter on Hemlock Spruce Firs. It is typical.

"We who perforce in early days of life sallied or were sent forth from home in quest of knowledge, to drink at the Pierian springs of Greek History within the classical courts of our public schools, may be prone to jump wrongly to a conclusion that the Hemlock tree had some connection with a certain deadly drug, that we were instructed by school-books was meted out to those who were regarded in the light of a social or political inconvenience by the *pro tem.* Government of the day which ruled in mighty Athens. . . . Socrates, whose mission it was to lecture—great Socrates, who adored speaking at all times, and who not only adored speaking, but adorned those to whom he spoke with a cloak of infinite wisdom, was enjoined—even if imperatively, let us hope at least in tones of politeness—by the performing clown of the gruesome scene, at the neurotic moment of his last drink upon earth, to keep silence and hold his tongue, and for no other substantial reason than that it might retard the action of the draught, and thereby involve the executioner in an uncalled-for expenditure in the purchase of more poison drug from the innermost recesses of his private purse!"

When discussing the longest-lived trees, he expresses himself as follows:

"The Bō tree (*Ficus religiosa*), sacred to Buddha, Prince of Sibbartha in Ceylon, claims an existence of 2,000 years, but, as it is no native, nor even naturalised, subject of Great Britain, it must be at once non-suited here, and any pros and cons, in the nature of evidence adduced, declined politely but firmly with thanks."

At other times the author beats about the bush for quite a time before making a plain statement of fact. This preliminary rigmarole may be quite justifiable in political speeches and in the better-class newspaper advertisement, but it is quite out of place in a scientific book. The author, for example, wishes to say that the common silver fir is one of the finest of conifers. Instead of saying so in plain English, or rather prior to saying so in plain English, he proceeds in this way:

"'You may tire of mountains and rivers, you may tire of the sea, but you can never tire of trees.'—LORD BEACONSFIELD.

"So spoke the departed statesman (more familiarly known as 'Dizzy') of the Victorian Era.

"There are some of us old enough to recall a cartoon in *Punch* that depicted the eminent statesman swung in a hammock in a tree in his garden, and murmuring self-complacently a measure of an Ariel's spirit song:

"'Dizzily, dizzily let me drowse
Under the shadow of Hughenden boughs.'

"Though he, Lord Beaconsfield and ex-Prime Minister of a Victorian age, was probably reposing in Virgilian attitude, after the manner of Tityrus, under the covering of a spreading branch on this particular occasion, we take it that the quoted expression of his untiring admiration for trees referred rather to the trees of landscapes generally than to any tree in particular. Be that as it may, it was a high compliment he paid to them; and if any Conifer deserves its share of the praise bestowed more than other, it is the Common Silver Fir, the mightiest and the highest of them all."

So much for the style of the book. And yet it is crammed with information of the right kind. There is another point. There are not enough illustrations. The addition of pictures of the different trees described would be a great advantage. They would greatly assist those readers who cannot get out and see the trees themselves; also pictures do help to relieve the monotony of a scientific book, and the published price admits of them.

A. S. R.

The New Psychology and Its Relation to Life. By A. G. Tansley. (George Allen & Unwin, Ltd., 10*s.* 6*d.* *net.*)

Mr. Tansley is to be congratulated upon having accomplished a timely and most useful work, and, thanks to his thorough grasp of the subject and his exceptional powers of exposition, he has done it so well that his book should stand, on the lowest ground, as a standard of treatment. In view of the literature which has rapidly arisen concerning psychology, it is at any rate safe to say that Mr. Tansley's book will most assuredly serve as an invaluable primer for some time to come.

The author is a botanist by training and profession, and no doubt the verve and lucidity which he displays, in the handling of a difficult science which is yet in its infancy, may owe something to that holiday feeling which we are expected to find in change of occupation, while it lacks nothing which we should expect from a man whose life-work has been in relation to a more exact and much older science.

We may freely admit that the value of a scientific work should not be prejudiced because it is written in halting sentences or slipshod English, but, just as a worthy picture deserves a good frame, so the value of Mr. Tansley's résumé is enhanced by the purity and ease of his diction.

The scope of the work is defined at the close of his introductory chapter, where he points out that "already great strides have been made towards a self-consistent and illuminating interpretation of the human mind, and the field of future investigation seems illimitable. At the same time it must be recognised that much of this wealth of material is but little developed scientifically, that there

[*Continued on p.* 284

is still much difference of opinion, and a good deal of room for alternative interpretations. That must be the excuse for the method of this book, which, because it essays in a short space, and perhaps overboldly, a systematic exposition of what appears to the author the essential framework of the subject, is obliged to be *a priori* and dogmatic in some places, and on the other hand to leave many important topics undeveloped or, at most, but roughly indicated. The aim is to present a picture, vaguely sketched in some parts, almost blank in others, but, it is hoped, not too much out of drawing."

The book under review, since its foundation is essentially biological, is necessarily based on McDougall's *Introduction to Social Psychology*, and it owes much also to Trotter's *Instincts of the Herd in Peace and War*, one of the outstanding original contributions to Social Psychology. If we desired to find any ground for adverse criticism, it would be that, if the author is overbold in some directions, he appears to us as being overtimid in others. He seems to us quite unnecessarily reticent on abnormality as dealt with by Dr. Bernard Hart in *The Psychology of Insanity*, more particularly in regard to the split-up of the ego which we find in people who, like Mr. Vale Owen, seem to be honestly unconscious of an easily ascertained fact, which is that the "revelations" which they pass on to us are but revelations of the state of their own minds.

Then, again, when Mr. Tansley approaches the concept of a Supreme Being, we become conscious of an increasing aridity. The essential humidity of the atmosphere has disappeared. We seem to have left arable pasture-land for the desert. He leaves us with the impression upon us, which may well be a false one, that He Whom we call the true God is never more than a creation of the human mind, like the gods of Greek or Roman mythology. Our contention is that many things which have been omitted are well within the scope of this work, although, of course, it is quite within the rights of the author to say "thus far and no farther." The sudden conversion, for instance, of a depraved and drunken man into a sober and useful citizen does not seem to us to be outside the scope of psychology as related to life. So with those whose lugubrious "revelations," if we accept them as Divine, would add a new terror to death, and persuade us that annihilation is the best thing that God can give us. Their subjective nature should be explained to the multitude and to the student, so that the use of "planchette" and the mental operations involved in this and other playthings of materialism run to seed shall be quite understood. We are far from suggesting that this is an unbalanced work. We are, to use the author's expression, merely indicating some of the "blanks." We believe him capable of taking us many steps further. Indeed, if we may parody one of Macaulay's poems, and if we may take the "ranks of Tuscany" as symbolising the possible cavillers, we believe that, if Mr. Tansley decides to emulate mentally the physical exploit of Horatius in "the brave days of old," and will take the plunge, he will not only gain a firm footing on the far side, but we shall find that even "the ranks of Tuscany" will scarce forbear to cheer.

A. H. L.

Peetickay. An Essay towards the Abolition of Spelling. By Wilfrid Perrett, Ph.D. (Heffer, 6s. net.)

Peetickay is a word the literal meaning of which we, being slow in the uptake, have not gathered from a reading of this little book. But actually it represents a new kind of alphabet which, the author claims, goes a long way in the direction of simplifying spelling.

Spelling apparently is the curse of school-life. Hours and hours which might be employed in training little boys in useful pursuits have to be absorbed in drilling children in the spelling, the idiotic spelling, of many of the words of our tongue. If children only knew, declares the author, what a lifelong mess and muddle they are letting themselves in for when they learn their ABC, they would declare a general strike. Receive, believe, seize, buccaneer, desiccate, chrysanthemum—what a suffering these words have occasioned in us!

The new alphabet proposed in this book contains the consonants of our own, each consonant now, however, being allowed to have one particular sound only. Several new and badly-needed consonants are added to represent sounds for which at present there is no adequate or logical representation. In the new alphabet the vowel-letters are dropped altogether, and replacing them are strokes, mostly straight lines, written in different directions and above or below the line like shorthand signs. For example, w | m ╱, p —, ╲ l g ╲ t ˌ represents "We may, pa, all go too," which students of Pitman's shorthand will recognise as the time-honoured question of page 1 of the handbook in a new form, characteristic of this age. For the sounds of our English tongue (the writer counts only forty of them, a number which very few phoneticians would admit to be adequate) he proposes definite symbols, and as the symbols for the consonants are for the most part those at present in use, and as the slopes of the vowel sounds which he recognises are all formed according to a scientific plan, the complete alphabet as far as it goes is easily understood and learned and should not be quickly forgotten.

When this is done, the spoken language becomes the standard, that is, one spells with the Peetickay alphabet simply as one hears. The surname Cholmondeley, if pronounced Chumley by the Cholmondeleys, is written in Peetickay as Chumley. Menzies may be written in several ways in Peetickay according to the taste and fancy of those who pronounce that surname. Since most words have one standard pronunciation alone—which may be learned from a dictionary or by hearing them pronounced by those who speak English most purely, namely (it is claimed) the inhabitants of Belgravia, Inverness, Dublin, and Wallasey—the writing of English in the new medium should not lead to confusion or to schism.

The value of a scheme of this kind is of course very great if it could be universally adopted. The present generation of little children learning to spell and to read for the first time would do so with very much greater ease than any previous one. The difficulty is with ourselves. To ask us to change the spelling of the whole English language, not gradually, as the Simplified Spelling

Society desires, but by a complete reform, is asking a great deal. And we think this great deal is too much. I know of one way alone by which it might be possible, and that is, that the *Daily Mail* use its front page each day for a month telling its readers what Peetickay is, and thereafter publish its news exclusively in the Peetickay type. Whatever happens, the appeal must be made in some way to everybody. To declare that the present system of spelling is silly, illogical, fatuous, or anything you like to an audience of twenty is not doing any good. With all this we agree—but we do nothing.

Changing the spelling of words is more hopeless than trying to introduce an ideal language. For an ideal language like Ido may exist side by side with our own, but if one thing is certain it is that we will not have simultaneously two ways of spelling.

A man once came to Oxford and suggested to the authorities there that if the High were first of all straightened out and then widened, if a few more colleges were built on the southern side, and if, finally, a mound with a castle upon it were erected on Christ Church meadow to dominate the whole, the High might then have some chance of competing with Princes Street, Edinburgh, in beauty. It was undoubtedly an excellent scheme. Many people told him so. What criticism there was was constructive. The single difficulty was in carrying the scheme out. That was insurmountable.

So we believe it is with new methods of spelling. We are much too attached to the present system ever voluntarily to allow changes to take place.

First of all it is a tremendous innovation, and secondly, rightly or wrongly, we believe that a great deal of beauty, of pleasant associations, and of happy memories are bound up with words as at present we know them. All this would disappear for us if we ceased to spell as we do. But for the sake of the young growing up, should we not be unselfish and give up the old system? As a nation we shall never rise (or fall) to that.

P. K. F.

Other Books Received

Human Efficiency and Levels of Intelligence. By H. H. Goddard, Director of the Bureau of Juvenile Research of Ohio. (Oxford University Press, 6*s.* 6*d.*)

Life of Sir Jagadis C. Bose, M.A., D.Sc., F.R.S. By Prof. Patrick Geddes. (Longmans, 16*s.*)

The Nomenclature of Petrology. By Dr. Arthur Holmes. (Murby, 12*s.* 6*d.*)

Discovery in Greek Lands. By F. H. Thomas, M.A. (Cambridge University Press, 8*s.* 6*d.*)

On Gravitation and Relativity. The Halley Lecture. By R. A. Sampson, D.Sc., F.R.S., Astronomer Royal for Scotland. (Clarendon Press, 2*s.*).

Microscopy. Third Edition. By Edmund J. Spitta, F.R.A.S., F.R.M.S. (John Murray, 25*s.*)

[*Continued on p.* 286

Early English Magic and Medicine. By Dr. CHARLES SINGER. (Oxford University Press, for British Academy, 4*s*.)

Space and Time in Contemporary Physics. By PROF. M. SCHLICK. Rendered into English by H. L. BROSE, M.A. (Clarendon Press, 6*s*. 6*d*.)

More Electrical Apparatus Making. By A. V. BALLHATCHET. (Percival Marshall, 3*s*. net.)

Splendours of the Sky. By ISABEL M. LEWIS, A.M. (John Murray, 8*s*. net.)

The Shibboleths of Tuberculosis. By MARCUS PATERSON, M.D. (John Murray, 10*s*. 6*d*. net.)

Internal Combustion Engines. By LIEUT.-COM. W. L. LIND, U.S.N. (Ginn & Co., 10*s*. net.)

Dead Towns and Living Men. Being pages from an Antiquary's Note-book. By C. LEONARD WOOLLEY. (Oxford University Press, 12*s*. 6*d*. net.)

Romance of the Dialect. By S. PARTINGTON. (J. Bagot, Middleton, 2*s*. 6*d*.)

Relativity. The Special and the General Theory. By PROF. A. EINSTEIN. Translated by R. W. LAWSON. (Methuen, 5*s*. net.)